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SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM V
EPA CONTRACT NO.: 68HE0319D0004

November 30, 2020

Mr. Peter Lisichenko, On-Scene Coordinator
U.S. Environmental Protection Agency, Region II
Superfund and Emergency Management Division
2890 Woodbridge Avenue
Edison, NJ 08837

EPA CONTRACT No: 68HE0319D0004
TD No.: TO-0036-0021
DC No.: STARTV-02-F-0037
SUBJECT: FINAL SITE-SPECIFIC UFP QUALITY ASSURANCE PROJECT PLAN HOLY TRINITY CEMETERY SITE, LEWISTON, NIAGARA COUNTY, NEW YORK

Dear Mr. Lisichenko,

Enclosed please find the Site-Specific Uniform Federal Policy (UFP) Quality Assurance Project Plan for the Removal Action (RV2) activities to be conducted by the U.S. Environmental Protection Agency, Region II (EPA) with the support of Weston Solutions, Inc., Superfund Technical Assessment & Response Team V (START V) at the Holy Trinity Cemetery Site (the Site) located in Lewiston, Niagara County, New York. This plan covers the soil sampling activities for waste characterization and soil blending calculations purposes to be conducted at the Site beginning December 1, 2020.

If you have any questions or comments, please do not hesitate to contact me at (732) 585-4413.

Sincerely,

WESTON SOLUTIONS, INC.

Sean Quinn
For: Bernard Nwosu
START V Site Project Manager

Enclosure:
cc: TD File: TO-0036-0021

FINAL SITE-SPECIFIC UFP QUALITY ASSURANCE PROJECT PLAN

HOLY TRINITY CEMETERY SITE

Lewiston, Niagara County, New York

Site Code: A23M
CERCLIS Code: NYN000206698

Prepared by:

Superfund Technical Assessment & Response Team V
Weston Solutions, Inc.
Federal East Division
Edison, New Jersey 08837

Prepared for:

U.S. Environmental Protection Agency, Region II
Superfund and Emergency Management Division
2890 Woodbridge Avenue
Edison, New Jersey 08837

DC No: STARTV-02-F-0037
TD No: TO-0036-0021
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November 2020

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ATTACHMENT B: Standard Operating Procedures (SOPs)
- ERT SOP # 2001: *General Field Sampling Guidelines*
- ERT SOP # 2006: *Sample Equipment Decontamination*
- ERT SOP # 2012: *Soil Sampling*
- *Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM)*

ATTACHMENT C: Action Levels
- EPA Removal Management Levels (RMLs)
- EPA Maximum Concentration of Contaminants (MCC) for toxicity characteristic as determined by TCLP
- NYSDEC Unrestricted Residential Use Soil Cleanup Objectives (UUSCO)

ATTACHMENT D: Laboratory Method Detection Limits

LIST OF ACRONYMS

ADR	Automated Data Review
ANSETS	Analytical Services Tracking System
AOC	Acknowledgment of Completion
ASTM	American Society for Testing and Materials
CEO	Chief Executive Officer
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CLP	Contract Laboratory Program
CFM	Contract Financial Manager
CO	Contract Officer
COI	Conflict of Interest
COO	Chief Operations Officer
CRDL	Contract Required Detection Limit
CRTL	Core Response Team Leader
CRQL	Contract Required Quantitation Limit
CQLOSS	Corporate Quality Leadership and Operations Support Services
CWA	Clean Water Act
DCN	Document Control Number
DI	Deionized Water
DPO	Deputy Project Officer
DQI	Data Quality Indicator
DQO	Data Quality Objective
EM	Equipment Manager
EDD	Electronic Data deliverable
ENVL	Environmental Unit Leader
EPA	Environmental Protection Agency
ERT	Environmental Response Team
FASTAC	Field and Analytical Services Teaming Advisory Committee
GC/ECD	Gas Chromatography/Electron Capture Detector
GC/MS	Gas Chromatography/Mass Spectrometry
HASP	Health and Safety Plan
HRS	Hazard Ranking System
HSO	Health and Safety Officer
ITM	Information Technology Manager
LEL	Lower Explosive Limit
LSASD	Laboratory Services and Applied Science Division
MSA	Mine Safety Appliances
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NELAC	National Environmental Laboratory Accreditation Conference
NELAP	National Environmental Laboratory Accreditation Program
NIOSH	National Institute for Occupational Safety and Health
NIST	National Institute of Standards and Technology
OSC	On-Scene Coordinator
OSHA	Occupational Safety and Health Administration

LIST OF ACRONYMS (Concluded)

OSWER	Office of Solid Waste and Emergency Response
PARCCS	Precision, Accuracy, Representativeness, Completeness, Comparability, Sensitivity
PAH	Polynuclear Aromatic Hydrocarbons
PCB	Polychlorinated Biphenyls
PIO	Public Information Officer
PM	Program Manager
PO	Project Officer
PRP	Potentially Responsible Party
PT	Proficiency Testing
QA	Quality Assurance
QAL	Quality Assurance Leader
QAPP	Quality Assurance Project Plan
QMP	Quality Management Plan
QA/QC	Quality Assurance/Quality Control
QC	Quality Control
RC	Readiness Coordinator
RCRA	Resource Conservation and Recovery Act
RPD	Relative Percent Difference
RSCC	Regional Sample Control Coordinator
RST	Removal Support Team
SARA	Superfund Amendments and Reauthorization Act
SEDD	Staged Electronic Data Deliverable
SOP	Standard Operating Practice
SOW	Statement of Work
SPM	Site Project Manager
START	Superfund Technical Assessment & Response Team
STR	Sampling Trip Report
TAL	Target Analyte List
TD	Technical Direction Document
TDL	Technical Direction Letter
TO	Task Order
TQM	Total Quality Management
TSCA	Toxic Substances Control Act
UFP	Uniform Federal Policy
VOA	Volatile Organic Analysis

TABLE 1: Crosswalk

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
A. Project Management and Objectives			
1 & 2	Title and Approval Page	2.2.1	Title, Version, and Approval/Sign-Off
3 & 5	Project Organization and QAPP Distribution	2.2.3	Distribution List
		2.2.4	Project Organization and Schedule
4, 7, & 8	Personnel Qualifications and Sign-Off Sheet	2.2.1	Title, Version, and Approval/Sign-Off
		2.2.7	Special Training Requirements and Certifications
6	Communication Pathways	2.2.4	Project Organization and Schedule
9	Project Planning Session Summary	2.2.5	Project Background, Overview, and Intended Use of Data
10	Conceptual Site Model (CSM)	2.2.5	Project Background, Overview, and Intended Use of Data
11	Project/Data Quality Objectives	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
12	Measurement Performance Criteria	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
13	Secondary Data Uses and Limitations	Chapter 3	QAPP ELEMENTS FOR EVALUATING EXISTING DATA
14 & 16	Project Tasks & Schedule	2.2.4	Project Organization and Schedule
15	Project Action Limits and Laboratory-Specific Detection/Quantitation Limits	2.2.6	Data/Project Quality Objectives and Measurement Performance Criteria
B. Measurement/Data Acquisition			
17	Sampling Design and Rationale	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
18	Sampling Locations and Methods	2.3.1	Sample Collection Procedure, Experimental Design, and Sampling Tasks
		2.3.2	Sampling Procedures and Requirements
19 & 30	Sample Containers, Preservation, and Hold Times	2.3.2	Sampling Procedures and Requirements
20	Field Quality Control (QC) Sample Summary	2.3.5	QC Requirements
21	Field Standard Operating Procedures (SOPs)	2.3.2	Sampling Procedures and Requirements

TABLE 1: Crosswalk (Concluded)

Optimized UFP-QAPP Worksheets		2106-G-05 QAPP Guidance Section	
B. Measurement/Data Acquisition			
22	Field Equipment Calibration, Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
23	Analytical SOPs	2.3.4	Analytical Methods Requirements and Task Description
24	Analytical Instrument Calibration	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
25	Analytical Instrument and Equipment Maintenance, Testing, and Inspection	2.3.6	Instrument/Equipment Testing, Calibration and Maintenance Requirements, Supplies and Consumables
26 & 27	Sample Handling, Custody, and Disposal	2.3.3	Sample Handling, Custody Procedures, and Documentation
28	Analytical QC and Corrective Action	2.3.5	QC Requirements
29	Project Documents and Records	2.2.8	Document and Records Requirements
C. Assessment/Oversight			
31, 32, & 33	Assessments and Corrective Action	2.4	ASSESSMENTS AND DATA REVIEW (CHECK)
		2.5.5	Reports to Management
D. Data Review			
34	Data Verification and Validation Inputs	2.5.1	Data Verification and Validation Targets and Methods
35	Data Verification Procedures	2.5.1	Data Verification and Validation Targets and Methods
36	Data Validation Procedures	2.5.1	Data Verification and Validation Targets and Methods
37	Data Usability Assessment	2.5.2	Quantitative and Qualitative Evaluations of Usability
		2.5.3	Potential Limitations on Data Interpretation
		2.5.4	Reconciliation with Project Requirements

QAPP Worksheet #1& 2: Title and Approval Page

1. Project Identifying Information

a) Site Name/Project Name: Holy Trinity Cemetery Site
b) Site Location/No.: Lewiston, Niagara County, New York / NYN000206698
c) Contract/Work Assignment No.: 68HE0319D0004 / TDD#: 0036-0021

2. Lead Organization

Weston Solutions, Inc.
1090 King Georges Post Road, Suite 201
Edison, New Jersey 08837

Lead Organization's Site Project Manager:

Bernard Nwosu		11/25/2020
Printed Name/Title	Signature	Date

Lead Organization's Technical Review:

Bernard Nwosu		11/25/2020
Printed Name/Title	Signature	Date

Lead Organization's QA/QC Chemist:

Smita Sumbaly		11/25/2020
Printed Name/Title	Signature	Date

EPA Region II On-Scene Coordinator:

Peter Lisichenko		
Printed Name/Title	Signature	Date

EPA Region II Quality Assurance Officer:

Printed Name/Title	Signature	Date

QAPP Worksheet #1& 2: Title and Approval Page (Concluded)

3. List plans and reports from previous investigation relevant to this project.

08/06/2015, Stie-Specific QAPP, Holy Trinity Cemetery Radiological Assessment, (RST3-02-D-0037)

04/12/2016, Site-Specific QAPP- Radiological Survey, Holy Trinity Cemetery Radiological Assessment, (RST3-02-D-0250)

08/17/2016, Site-Specific UFP Quality Assurance Project Plan, Holy Trinity Cemetery Assessment, (RST3-03-D-0230)

05/02/2017, Site-Specific UFP QAPP, Revision 1, Holy Trinity Cemetery Assessment, (RST3-03-D-0258)

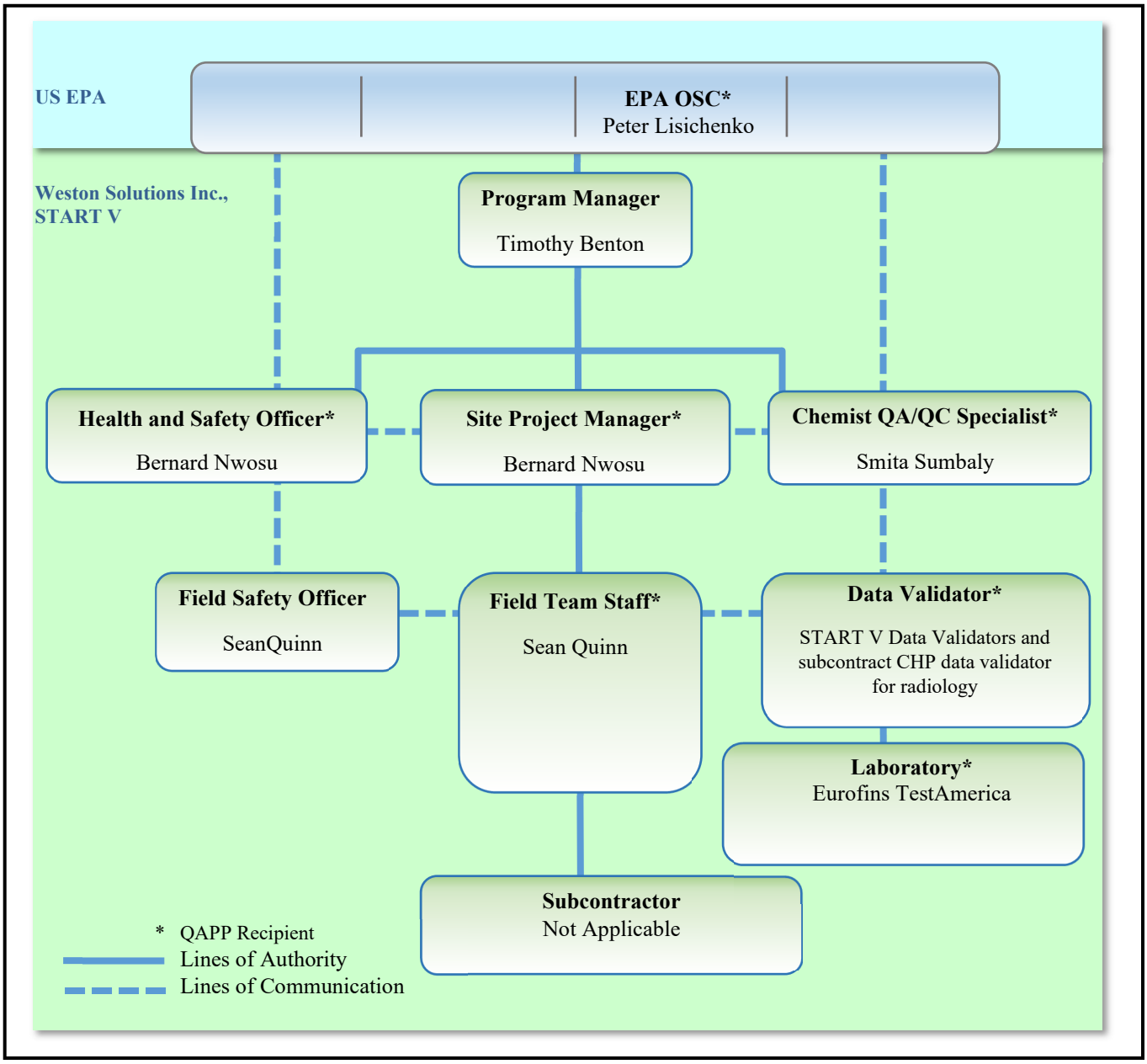
09/11/2019, Removal Assessment Report, Area 6 and 7, Holy Trinity Cemetery, (STARTV-01-D-0065)

11/05/2020 Site-Specific UFP QAPP, Holy Trinity Cemetery Assessment, (STARTV-02-D-0059)

Exclusions:

Not applicable.

QAPP Worksheet #3 & 5: Project Organizational and QAPP Distribution



Acronyms:
EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator
QA/QC – Quality Assurance/Quality Control
START V – Superfund Technical Assessment & Response Team V
QAPP – Quality Assurance Project Plan

QAPP Worksheet #3 & 5: Project Organizational and QAPP Distribution (Concluded)

QAPP Recipient	Title	Organization	Telephone Number	Fax Number	E-mail Address	Document Control Number
Peter Lisichenko	OSC	EPA, Region II	(347) 276-6251	Not Applicable	lisichenko.peter@epa.gov	STARTV-02-D-0083
Bernard Nwosu	HSO/SPM	Weston Solutions, Inc., START V	(908)-565-2980	Not Applicable	Ben.Nwosu@westonsolutions.com	STARTV-02-D-0083
Sean Quinn	Field Personnel	Weston Solutions, Inc., START V	(732)-425-1175	Not Applicable	Sean.Quinn@WestonSolutions.com	STARTV-02-D-0083
Smita Sumbaly	QAO	Weston Solutions, Inc., START V	(732) 585-4410	Not Applicable	S.Sumbaly@westonsolutions.com	STARTV-02-D-0083
Site TD File	START V Site TD File	Weston Solutions, Inc., START V	Not Applicable	Not Applicable	Not Applicable	STARTV-02-D-0083

QAPP – Quality Assurance Project Plan
EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator
SPM – Site Project Manager
START V – Superfund Technical Assessment & Response Team V
QAO – Quality Assurance Officer
HSO – Health & Safety Officer
TD – Technical Direction

QAPP Worksheet #4, 7 & 8: Personnel Qualification and Sign-off Sheet

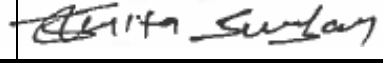
Project Function	Specialized Training By Title or Description of Course	Training Provider	Training Date	Personnel / Groups Receiving Training	Personnel Titles / Organizational Affiliation	Location of Training Records / Certificates[1]	Date of Training
[Specify location of training records and certificates for samplers]							
QAPP Training	This training is presented to all START V personnel to introduce the provisions, requirements, and responsibilities detailed in the UFP QAPP. The training presents the relationship between the site-specific QAPPs, SOPs, work plans, and the Generic QAPP. QAPP refresher training will be presented to all employees following a major QAPP revision.	Weston Solutions, Inc., (In House Training)	As needed	All START V field personnel upon initial employment and as refresher training	Weston Solutions, Inc.	Within Division	February 2020
Health & Safety Training	Health and safety training will be provided to ensure compliance with Occupational Safety and Health Administration (OSHA) as established in 29 CFR 1910.120.	Weston Solutions, Inc., (In House Training)	Yearly at a minimum	All Employees upon initial employment and as refresher training every year	Weston Solutions, Inc.	Within Division	February 2020
Others	Scribe, ICS 100 and 200, and Air Monitoring Equipment Trainings provided to all employees	EPA ERT (In-House Training) FEMA (On-line Training) Weston Solutions, Inc., (In House training)	Upon initial employment and as needed				February 2020
	Dangerous Goods Shipping	Weston Solutions, Inc., (In House Training)	Every 3 years				April 2019

All team members are trained in the concepts and procedures in recognizing opportunities for continual improvement, and the approaches required to improve procedures while maintaining conformance with legal, technical, and contractual obligations.

[1]All members, including subcontractors, certifications are in possession of Health & Safety Officer.

QAPP Worksheet #4, 7 & 8: Personnel Qualification and Sign-off Sheet

Organization: Weston Solutions, Inc., START V

Name*	Project Title/Role	Education and Experience Qualifications	Specialized Training/ Certifications	Organizational Affiliation	Signature	Date
Sean Quinn	SPM (Alternate)/ Field Personnel, START V	3+ year*	Implementing and executing technical, QA and health and safety during sampling event, sample collection and sample management.	Weston Solutions, Inc.		11/30/2020
David Benoit	Field Personnel, START V	2+ years*	Sample Collection/Sample Management	Weston Solutions, Inc.		11/30/2020
Bernard Nwosu	HSO/SPM, START V	25+ years*	Remote support during execution of sampling event, Health and Safety Officer	Weston Solutions, Inc.		11/30/2020
Smita Sumbaly	QAO, START V	30+ years*	Chemist QA/QC Specialist	Weston Solutions, Inc.		11/30/2020

*All START V members and subcontractor's resumes are in possession of Program Manager, EPA Project Officer, and Contracting officers
SPM – Site Project Manager
START V – Superfund Technical Assessment & Response Team V
QAO – Quality Assurance Officer
HSO – Health & Safety Officer
QA/QC – Quality Assurance/Quality Control

Organization: EPA Region II

Name	Project Title/Role	Education and Experience Qualifications	Specialized Training/ Certifications	Organizational Affiliation	Signature	Date
Peter Lisichenko	EPA OSC	NA	All project coordination, direction and decision making.	EPA, Region II		

EPA – U.S. Environmental Protection Agency
OSC – On-Scene Coordinator

QAPP Worksheet #6: Communication Pathways

Communication Drivers	Responsible Entity	Name	Phone Number	Procedure
Point of contact with EPA OSC	SPM, Weston Solutions, Inc., START V	Bernard Nwosu	(732) 585-4413 (908)-565-2980	All technical, QA and decision-making matters in regard to the project (verbal, written or electronic)
Adjustments to QAPP	SPM, Weston Solutions, Inc., START V	Bernard Nwosu	(732) 585-4413 (908)-565-2980	QAPP approval dialogue
Health and Safety On-Site Meeting	HSO, Weston Solutions, Inc., START V	Bernard Nwosu	(732) 585-4413 (908)-565-2980	Explain Site hazards, personnel protective equipment, hospital location, etc.
Lab Data Quality Issues (including sample receipt variances and laboratory quality control variances)	Laboratories Project Managers Eurofins TestAmerica	Mike Franks	(314) 787-8201	Laboratory PMs will report any issues with project samples to the WESTON Chemist QA/QC Specialist within 1 business day of notification. The WESTON Chemist QA/QC Specialist will contact the field sampler if necessary, to resolve sample receiving discrepancies.
Data verification and data validation issues	START V Data Validators	Smita Sumbaly	(732) 585-4410	START V Data Validator will review non-CLP data verification and validation.
Analytical Corrective Actions	WESTON Chemist QA/QC Specialist START V Data Validator or Laboratory PMs	Smita Sumbaly	(732) 585-4410	If laboratory corrective actions are necessary, the WESTON Chemist QA/QC Specialist will communicate with laboratory project manager.
Data Tracking and Management, Release of Analytical Data	WESTON Chemist QA/QC Specialist WESTON SPM/Operations Manager	Smita Sumbaly Bernard Nwosu	(732) 585-4410 (732) 585-4413	The need for corrective actions will be determined by the SPM upon review of the data. No analytical data will be released prior to validation and all releases must be approved by the Chemist QA/QC Specialist, SPM and EPA OSC/TM.

OSC: On-Scene Coordinator
SPM: Site Project Manager
HSO: Health and Safety Officer
QA/QC: Quality Assurance/Quality Control
START V: Superfund Technical Assistance & Response Team V
CHP: Certified Health Physicist

QAPP Worksheet #9: Project Planning Session Summary

Date of Planning Session: 11/24/2020

Location: Phone Call

Purpose: Scoping meeting for UFP-QAPP for EPA Region II Superfund Technical Assessment & Response Team V

Name	Title/Role	Organization	E-mail Address	Phone No.
Peter Lisichenko	EPA OSC	EPA	lisichenko.peter@epa.gov	(732)-321-4350
Bernard Nwosu	START V	WESTON	Ben.Nwosu@WestonSolutions.com	(732) 585-4413

Site-Specific Initial Scoping Meeting Notes/Comments:

Weston Solutions, Inc., Superfund Technical Assessment & Response Team V (START V) has been tasked by the U.S. Environmental Protection Agency, Region II (EPA) with providing field sampling support as part of initial Removal Action (RV2) activities in the residential areas of concern (AOCs), including Area 6 and Area 7, associated with the Holy Trinity Cemetery Site (the Site) in Lewiston, New York. Prior to mobilizing to the Site, START V will contact Dig Safely New York and request a mark-out of all subsurface public utilities located within the right-of way (ROW) areas near the AOCs. Two soil sampling locations will be selected on-site at the AOCs by the EPA On-Scene Coordinator (OSC) based on the results of a previous radiological survey conducted at the Site. Utilizing a coring device, START V will core through the surface concrete or asphalt to expose the underlying soil at the selected sampling locations. Utilizing non-dedicated stainless-steel hand augers, borings will be advanced at the cored locations to depths up to 24 inches bgs. START V will collect three grab soil samples comprising soil/rocks/slag, including quality assurance/quality control (QA/QC) samples, from depths bgs. as directed by the EPA OSC from the two sampling locations. Sample depth intervals will be biased to depths where gamma readings exceed 2 times (2x) background. The three grab soil samples, including QA/QC samples, will be submitted for laboratory analyses of target analyte list (TAL) volatile organic compounds (VOCs), TAL semivolatile organic compounds (SVOCs), TAL pesticides, TAL polychlorinated biphenyls (PCBs), TAL metals including mercury (Hg), cyanide (CN), herbicides, and radiochemistry, including gamma spectroscopy for thorium-234 (Th-234), protactinium-234 (Pa-234) or Pa-234m, lead-214 (Pb-214), and bismuth-214 (Bi-214) from the uranium decay chain; radium-228 (Ra-228) and/or actinium-228 (Ac-228), Ra-224, Pb-212, Bi-212, and thallium-208 (Tl-208) from the thorium decay chain; other gamma emitting radioisotopes including cesium-137 (Cs-137) and potassium-40 (K-40), and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth; and alpha spectroscopy for uranium-233/234 (U-233/234), U-235/236, U-238, Th-230, Th-232, and Th-228. In addition, two composite soil samples, including QA/QC samples, will be collected from both sampling locations and submitted for laboratory toxicity characteristic leaching procedure (TCLP) VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including mercury, and Resource Conservation and Recovery Act (RCRA) characteristics, analyses. The three grab soil samples, including QA/QC samples and two composite soil samples, including QA/QC samples, are being collected for waste characterization purposes. Furthermore, up to 31 soil/rocks/slag samples, including QA/QC samples, will be collected from four additional locations in the driveway of Area 6, two additional locations in the garage of Area 7, and any other location of interest, as determined by the EPA OSC. The additional soil samples will be collected from each sampling location at depth 0-6, 6-12, 12-18, and 18-24 inches bgs.

QAPP Worksheet #9: Project Planning Session Summary (Concluded)

The additional soil samples are being collected for soil blending calculations purposes and will be submitted to the assigned laboratory for radiochemistry (gamma spectroscopy and alpha spectroscopy), analysis. A rinsate blank will be collected each day of sampling and submitted for laboratory TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including Hg, CN, herbicides, and radiochemistry (gamma spectroscopy and alpha spectroscopy), analyses in order to verify the adequacy of the decontamination of non-dedicated sampling equipment. All the cored sampling locations will be backfilled in reverse order with the excavated soil after sampling and tamped down. Significant observations and site activities will be documented in the Site logbook and with photographs. All sampling locations will be documented using global positioning system (GPS).

Consensus Decisions Made:

The Removal Action sampling event is scheduled to begin on December 1, 2020. The analytical results of the soil/rocks/slag samples will be compared with the EPA Site-Specific Preliminary Remediation Goals (PRGs) for radiological parameters, EPA Removal Management Levels (RMLs), New York State Department of Environmental Conservation (NYSDEC) Unrestricted Residential Use Soil Cleanup Objectives (UUSCO), and EPA Maximum Concentration of Contaminants (MCC) for toxicity characteristic as determined by TCLP in order to characterize the soil for waste disposal and soil blending calculations purposes when RV2 activities are initiated.

Action Items:

Action	Responsible Party	Due Date
Prepare CLP Analytical Request Form	SPM, START V	10/19/2020 & 11/24/2020
Prepare RST Analytical Request Form	SPM, START V	10/19/2020 & 11/24/2020
Develop Health and Safety Plan	SPM, START V	11/30/2020
Develop Quality Assurance Project Plan	SPM, START V	11/30/2020
Develop Work Plan (driller, sampler, survey, etc.)	SPM, START V	Not Applicable
Develop Equipment List	SPM, START V	11/24/2020
Develop Site-Specific Data Management Plan	SPM, START V	11/24/2020

QAPP Worksheet #10: Conceptual Site Model

Background Information:

The Site consists of approximately 2.91 acres of radionuclide contamination located at a cemetery that is approximately 31.5 acres in size. The Site is owned by Holy Trinity Cemetery of Divine Mercy Parish and is located in Lewiston, Niagara County, New York. The areas of observed contamination are located in the north-western portion of the property on a relatively flat and slightly elevated grassy field, under existing roadways, and at an isolated area adjacent to the Interstate 190 (I-190) corridor. There is one building on the Site which is utilized as both a residence and a cemetery maintenance facility. The Site is bordered to the north and east by I-190; to the south by Gate of Heaven Cemetery; and to the west by Robert Avenue and a residential area.

Based on historical information, EPA identified nine AOCs at the Site, including six on-site AOCs and three off-site AOCs. The on-site AOCs are identified as Area 1 through Area 4 and Area 8, comprising the grassy open fields and undeveloped portions of the Site, and Area 9, comprising portions of the non-public Site road network. The off-site AOCs are identified as Area 5 through Area 7, comprising three residences located adjacent to the Site, including 5374 Robert Avenue (Area 5), 5380 Robert Avenue (Area 6), and 5382 Robert Avenue (Area 7).

In 1978, the U.S. Department of Energy (DOE) conducted an aerial radiological survey of the Niagara Falls region and identified more than 15 properties having elevated levels of radiation above background levels. It is believed that, in the early 1960s, slag from an unknown source was used as fill on the properties prior to paving. Based on the original survey and subsequent investigations, it is believed that the radioactive slag was deposited on the Site.

In February 1980, the New York State Department of Health (NYSDOH) Bureau of Radiological Health and the Niagara County Health Department conducted a ground radiological survey of the Site to identify areas with elevated radioactivity resulting from the use of radioactive slag as fill on the property. The survey was conducted based on information that the slag used at the cemetery was from the same source used at two other locations in nearby Niagara Falls, which had been identified by the NYSDOH as containing elevated levels of radioactivity. During the survey, cemetery personnel showed NYSDOH a slag pile located near the caretaker's garage in the western portion of the property. Cemetery personnel stated that this slag was used as fill for the cemetery roads throughout the property.

In addition, the slag was used as fill for the base of two proposed roadbeds that extended approximately 500 to 600 feet from the caretaker's garage, northwest toward Robert Avenue. At the time of the survey, the construction of these roads had been abandoned. The underlying slag base was covered with an unknown amount of soil and was left as an open field. Using an Eberline PRM-7 radiation meter, ground radiological survey of the slag pile indicated gamma radiation measuring 250 microroentgens per hour (µR/hr) and along cemetery roads, gamma readings ranged from 5 µR/hr (*i.e.*, background concentration) to 30 µR/hr. Gamma readings along the abandoned roadbeds ranged from 200 µR/hr to 400 µR/hr. Samples of the slag were collected as part of the investigation. Laboratory analysis of the samples indicated that the concentrations of isotopic uranium, isotopic thorium, radium-226 (Ra-226), and radium-228 (Ra-228), were significantly higher than background values.

QAPP Worksheet #10: Conceptual Site Model (Continued)

In October 2006, the New York State Department of Environmental Conservation (NYSDEC) and the Niagara County Health Department conducted a reconnaissance of the Site. At the time, the slag pile previously observed near the caretaker's garage was no longer on the Site; the current caretaker had neither knowledge of the slag pile, nor what happened to it. The caretaker also indicated that children living nearby used this area for recreation. Since the 1980 NYSDOH site investigation, trees had grown through the abandoned slag roadbeds, pushing the slag to the surface. As part of the Site visit, NYSDEC conducted a ground radiological survey with an Exploranium GR-135. Radiological measurements taken while walking along the roadbed indicated gamma readings ranging from 200 to 450 µR/hr at waist height (approximately 1 meter/3 feet above the ground) and contact reading (approximately 1 inch above the ground) ranging from 450 to 570 µR/hr. Contact reading taken next to exposed slag near a tree was documented at 700 µR/hr. The NYSDEC collected four slag samples which were analyzed for isotopic uranium and isotopic thorium via gamma-ray spectroscopy. Laboratory analytical results indicated the presence of uranium-238/234 (U-238/234) at concentrations ranging from 114 picocuries per gram (pCi/g) to 1,664 pCi/g and thorium-232 (Th-232) from 114 pCi/g to 898 pCi/g.

In May 2007, NYSDEC visited the Site to verify contamination in an on-site debris pile using gamma-ray spectroscopy. During a 5-minute static survey, Ra-226 was the only radionuclide identified. A similar survey conducted on one of the roadbeds confirmed the presence of Th-232.

During a reconnaissance performed by the NYSDOH and NYSDEC in July 2013, a ground radiological survey of on-site roadways and along the back roadway leading off-site was conducted using a pressurized ion chamber (PIC) and a sodium iodide (NaI) 2x2 scintillator. Measurements taken along the roadways with the PIC indicated gamma levels up to 51 µR/hr and up to 50,000 counts per minute (cpm) with the NaI scintillator.

On December 12 and 13, 2013, EPA's contractor, Weston Solutions, Inc., Site Assessment Team (SAT), currently the Superfund Technical Assessment and Response Team V (START V), collected a total of 14 subsurface soil samples and three slag samples from the Site. Soil samples were also collected from two locations suspected to be outside of the source area in order to document background conditions. At each sample location, soil samples were collected directly beneath slag material; at locations where a radioactive fill layer was not visually observed the soil sample was collected at the equivalent depth interval. Each slag sample consisted of one single piece of slag material. The soil samples were analyzed by Test America Laboratories (TestAmerica) for target analyte list (TAL) metals via EPA SW846; isotopic thorium and isotopic uranium via DOE alpha spectroscopy Health and Safety Laboratory (HASL)-300 Method A-01-R; Ra-226, Ra-228, and other gamma emitting radioisotopes via DOE gamma spectroscopy HASL-300 Method GA-01-R. The slag samples were analyzed for the same radiological parameters as the soil samples, but were not analyzed for TAL metals. Analytical results indicated that concentrations of radionuclides in all the slag samples and seven soil samples including the field duplicate, were significantly higher than at background conditions.

On May 1, 2014, SAT collected radon and thoron concentration measurements from locations on and in the vicinity of the Site. At the selected locations in background areas, above the source material, and off the source area, radon and thoron concentration measurements in picocuries per liter (pCi/L) were collected with RAD7 radon/thoron detectors. The radon and thoron

QAPP Worksheet #10: Conceptual Site Model (Continued)

measurements were collected at heights of one meter above the ground surface. Radon and thoron concentrations were at normal background levels.

On August 10 through 13, 2015, EPA and RST 3, currently START V, conducted a Removal Assessment of the Site. The presence/absence of radon, thoron, and gamma radiation was verified through ground radiological surveys. Areas of observed contamination were delineated by comparing radiological survey measurements from suspected source areas with measurements obtained from a background location. Laboratory analytical results were used to verify the concentration of radon in living spaces of the one on-site building and to determine the presence of residual contamination and potential releases of radiation-containing material in soil and fill at the Site. Ground radiological survey measurements were collected on-site using fluke pressurized ionization chamber (FPIC), Ludlum-2241, and Reuter-Stokes high pressure ion chamber (HPIC). In order to define the basis for comparing ground radiological survey results, it was necessary to establish background reading at the Site. Background readings were collected with each of the instruments from locations on-site that were presumed to be unaffected by historic Site activities. Background gamma measurements included readings collected with Ludlum-2241 (9,900 to 10,700 cpm), FPIC (7 to 16 µR/hr at waist height and 9 to 17 µR/hr at contact), and HPIC (9.52 µR/hr). Specific isotopes were identified using a Berkeley Nucleonics Corporation (BNC) SAM 940™ (SAM 940) portable radioisotope identification system. A Durridge RAD7 electronic radon/thoron detector was utilized to measure the concentration of radon and thoron in ambient air. Background radon/thoron concentrations ranged from 0 to less than (<) 4.0 pCi/L, and no radionuclides were detected with the SAM-940 at the selected background location.

During the August 2015 radiological investigation, gamma measurements taken with the Ludlum-2241 in the one on-site building were generally at background levels, with a few locations indicating gamma readings that were slightly above background. The highest gamma measurement collected in the one on-site building was 16,100 cpm in the viewing room. Gamma measurements taken with the Ludlum-2241 in exterior locations throughout the Site were generally above background, with the highest reading at 569,000 cpm (more than 53 times [53x] above background). Gamma measurements collected with the FPIC in the one on-site building were generally at background levels ranging from 3 µR/hr (at waist height) to 19 µR/hr (at contact). Gamma measurements taken with the HPIC at three locations in the one on-site building ranged from 9.56 µR/hr to 10.94 µR/hr. Exterior HPIC gamma measurements were generally above background. The HPIC gamma measurements collected from eight locations selected on-site for soil sampling ranged from 10.02 µR/hr to 256.34 µR/hr (more than 26x above background). At one location on the east side of the on-site dirt road, Ra-226 was detected with the SAM-940. Based upon results from radon/thoron surveys conducted with RAD7, radon and thoron concentrations were at normal background levels in the on-site building; however, at all eight soil sampling locations, radon concentration was above background in contact measurement collected from one soil sampling location, thoron concentrations were above background in waist-level measurements collected at five soil sampling locations and above background in contact measurements collected at two soil sampling locations.

On August 10 through 13, 2015, RST-3 procured National Radon Safety Board (NRSB)-certified company, Accu-View Property Inspections (Accu-View), utilized passive activated charcoal canisters (radon canisters) to conduct short-term radon sampling tests that lasted a minimum of

QAPP Worksheet #10: Conceptual Site Model (Continued)

approximately 72 hours. A total of 15 radon canisters, including two field duplicates, and one field blank, were deployed in the one on-site building. Radon testing locations were focused on frequently occupied spaces in the building. Analytical results indicated that concentrations of radon were below the EPA Site-Specific Action Level (SSAL) of 4.0 pCi/L in all the living spaces sampled in the building.

On August 12, 2015, RST 3 conducted a soil sampling event to verify the presence of residual radioactive material in on-site soil. Based on radiological survey data from SAT's prior site investigation, and survey data from the August 2015 radiological investigation, soil sampling locations suspected to contain radionuclides and metals/metalloids were identified on-site by EPA. A total of nine soil samples, including one field duplicate, were collected at depths 0 to 4 feet below ground surface (bgs) from eight location on-site. The soil samples were analyzed by TestAmerica for TAL metals (including mercury) via EPA SW846; isotopic thorium and isotopic uranium via alpha spectroscopy HASL-300-A-01-R; Ra-226 (21 days ingrowth), Ra-228 and other gamma emitting radioisotopes via gamma spectroscopy HASL-300-GA-01-R. Analytical results indicated that concentrations of Ra-226 exceeded the EPA SSAL (established by EPA in August 2015) of 4.06 pCi/g in three of the nine soil samples. The concentration of cobalt was above the EPA Removal Management Level (RML) of 70 milligrams per kilograms (mg/kg) in one soil sample with exceedance concentration at 110 mg/kg. Thallium concentration was above the EPA RML of 2.3 mg/kg in one soil sample with exceedance concentration at 2.4 mg/kg.

On August 12, 2015, EPA collected four wipe samples including one field blank, from access doorways in the on-site building. The wipe samples were collected to determine if radiation-containing material was being tracked into the building. The wipe samples were analyzed by EPA using Ludlum-3030. Based upon the analytical results of the wipe samples for the selected counting durations, the minimum detectable concentration (MDC) for 100 square centimeters (cm^2) were determined as 0.80 disintegrations per minute (dpm) and 29.5 dpm respectively, for alpha and beta particles. These levels were below the 100 dpm and 1,000 dpm respectively, for alpha and beta counts outlined in the *New York City* Department of Health and Mental Hygiene (NYC DOHMH) Article 175 of the NYC Health Code, "Radiation Control", §175.03 - Release of Materials or Facilities, which was adopted by EPA as the SSAL for alpha and beta particles. Alpha and beta counts for all the wipe samples were at the natural background level conservatively estimated by counting a blank wipe.

In April 2016, EPA performed Removal Assessment activities at AOCs associated with the Site. Utilizing an all-terrain vehicle (ATV), RST 3 conducted ground radiological survey at seven of the nine AOCs in order to identify locations indicating presence of radiation-containing material and to define the extent of contamination in the AOCs. The radiological survey instrumentation setup included a Ludlum-2241, 3x3 NaI scintillator, and a global positioning system (GPS) unit connected to EPA's VIPER system (a wireless network-based communications system) that transmitted instantaneous gamma readings and geographical reference locations in real-time. Air monitoring using DustTrak particulate monitors and air sampling using RADēCO volumetric air sampler was performed daily at the AOCs during radiological survey activities to ensure that fugitive dust levels during survey activities did not pose a health hazard to site personnel and the public. Based on the results of the ground radiological survey, approximately 50 percent (%) of Area 1; portions northeast, south, and southwest of Area 2, as well as portions of the non-public

QAPP Worksheet #10: Conceptual Site Model (Continued)

Site road network immediately south of Area 2; discontinuous hot spots identified in the southern and southeast portions of Area 3; a dirt pile located on the eastern portion of Area 4; and portions of Area 9 immediately south of Area 1 and Area 3; all indicated gamma readings exceeding 3x background. Gamma readings at Area 5 and Area 8 were at normal background levels. Baseline air monitoring results indicated that particulate concentrations were generally below 50 micrograms per cubic meter ($\mu g/m^3$). Daily air monitoring results indicated that particulate concentrations during radiological survey activities were generally below the minimum SSAL of 100 $\mu g/m^3$. Screening results of air filter samples collected with the RADēCO during radiological survey activities indicated that alpha, beta, and gamma particles were at normal background levels.

On April 22 through 24, 2016, RST-3 procured NRSB-certified Company, Accu-View, conducted radon sampling in the residence at Area 5 by in order to verify if radon was present in living spaces of the residence and, subsequently determine if the installation of a radon mitigation system in the residence was necessary. Analytical results of 12 pre-mitigation radon samples, including one field duplicate, and one field blank, collected from the residence in Area 5 indicated radon concentrations were equal to or exceeded the EPA SSAL of 4.0 pCi/L in five of the samples. Based on the pre-mitigation radon analytical results, on May 24, 2016, EPA conducted a walk-through at Area 5 and identified a location in the residence to install a radon mitigation system. On June 15, 2016, a radon mitigation system was installed in the residence at Area 5. On August 1 through 4, 2016, a post-mitigation radon sampling event was performed to verify the effectiveness of the radon mitigation system in reducing the concentration of radon in the residence. Analytical results of the post-mitigation radon sampling event indicated that radon concentrations were at normal background levels.

On August 18, 2016, RST 3 collected a total of 30 soil samples from seven soil sampling locations identified by the EPA at Area 5. Using non-dedicated hand shovels and pickaxe, test pits were advanced to depths bgs. Soil samples were collected from six locations at depths 0 to 6, 6 to 12, 12 to 18, and 18 to 24 inches bgs, and from one location at depths 2 to 8, 8 to 14, 14 to 20, and 20 to 26 inches bgs. All the soil samples were analyzed by a laboratory for isotopic thorium, isotopic uranium, and other alpha emitting actinides via alpha spectroscopy HASL-300 Method U-02; radium-226 (21-day ingrowth), radium-228, and other gamma emitting radioisotopes via gamma spectroscopy EPA Method 901.1. Analytical results of the 30 soil samples, including two field duplicates, collected from Area 5, indicated that concentrations of target radionuclides were below the EPA SSALs.

On October 14, 2016, RST 3 utilized the Ludlum-2241 and NaI 3x3 scintillator with VIPER setup to perform exterior radiological survey at two off-site AOCs, Area 6 and Area 7. Background gamma reading was approximately 13 µR/hr. Radiological survey completed at both AOCs indicated portions of the property boundary between Area 6 and Area 7 had gamma readings ranging from 26 µR/hr to 39 µR/hr, which exceeds 2x to 3x background, respectively. Consequently, RST 3 advanced two test pits in Area 6 and one test pit in Area 7 using non-dedicated hand shovels and pickaxes to a depth of 2 feet bgs at the locations where elevated gamma measurements were identified. The soil samples were screened using HPGe and then submitted for laboratory gamma spectroscopy and alpha spectroscopy, analyses. Based on screening and analytical results, concentrations of Ra-226 exceeded the EPA SSAL of 4.06 pCi/g in the soil samples collected from both properties.

QAPP Worksheet #10: Conceptual Site Model (Concluded)

On May 12 through 15, 2017, RST 3-procured NRSB-certified company, Accu-View, performed radon sampling in the residences at Area 6 and Area 7. A total of 17 radon canister samples, including one field duplicate (co-located sample), were collected from the residence at Area 6 and a total of 18 radon canister samples, including one field duplicate, were collected from the residence at Area 7. Analytical results of the radon samples collected from both properties were below the EPA Action Level of 4.0 pCi/L for radon.

On May 16, 2017, RST 3 conducted test pit soil sampling at Area 6 and Area 7. Utilizing a mini excavator, one test pit each was advanced to depths 4 feet bgs at the selected locations in both AOCs. A total of eight heterogeneous samples of soil/slag/rock were collected from the one test pit in Area 6 and nine heterogeneous samples of soil/slag/rock, including one field duplicate, were collected from the one test pit in Area 7. The samples were submitted for laboratory radiochemistry (gamma spectroscopy and alpha spectroscopy) analysis. Based on analytical results, concentrations of Ra-226 exceeded the EPA SSAL of 4.06 pCi/g in the soil samples collected from both properties.

QAPP Worksheet #11: Project/Data Quality Objectives

1. State the Problem:

During exterior radiological survey conducted at the Site, EPA identified hot spots within the driveway of residential AOCs located on the Site. Soil samples were collected for laboratory analysis from the hot spots and a background location to verify the presence of radionuclide contamination at the AOCs. Based on the elevated gamma readings documented during the initial soil sampling event and analytical results from soil samples collected from the AOCs, EPA has determined that a Removal Action is warranted in order to mitigate the health threat posed by the presence of radiological contamination within the residential AOCs associated with radiological material from the Site. As part of initial Removal Action activities at the Site, EPA has requested START V to support the sampling of the soil at the hot spots for laboratory analysis in other to characterize the soil for disposal and soil blending calculation purposes.

2. Identify the Goals of the Study:

- Up to five waste characterization soil samples, including QA/QC samples, will be collected from two locations within the AOCs.
- The waste characterization soil samples will be submitted for laboratory analyses, including radiochemistry, Full TAL including mercury, cyanide, herbicides, Full TCLP including mercury, and RCRA characteristics.
- The analytical results of the waste characterization soil samples will be compared against the EPA Site-Specific PRGs, EPA RMLs, NYSDEC UUSCO, and EPA MCCs for toxicity characteristic as determined by TCLP and utilized by EPA to assess the soil for disposal purposes.
- Up to 31 soil samples, including QA/QC, will be collected from six locations, and any other location of interest, as determined by the EPA OSC, within the AOCs for laboratory radiochemistry analysis. The analytical results of the soil samples will be compared against the EPA Site-Specific PRGs and utilized for soil blending calculations purposes.

3. Identify Information Inputs:

Up to three grab waste characterization soil samples, including QA/QC samples, will be collected for laboratory analyses, including gamma spectroscopy for Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain; other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 homogenized for 21 day ingrowth; alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228; TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including mercury, cyanide, and herbicides. Up to two composite waste characterization soil samples, including QA/QC samples, will be collected for laboratory analyses of TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including mercury, and RCRA characteristics. Up to 31 soil samples for blending calculations, including QA/QC samples, will be collected for laboratory analyses, including gamma spectroscopy for Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain, Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain; other gamma emitting radioisotopes, including Cs-137 and K-40, and Ra-226 using Bi-214 and/or

QAPP Worksheet #11: Project/Data Quality Objectives (Continued)

Pb-214 homogenized for 21 day ingrowth; alpha spectroscopy for U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228. Rinsate blanks will be collected each day of sampling to demonstrate the adequacy of the decontamination of non-dedicated sampling equipment (*i.e.*, hand augers and metal scoops) and will be analyzed for isotopic thorium, isotopic uranium, other gamma emitting isotopes, TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including mercury, cyanide, and herbicides.

4. Define the Boundaries of the Study:

Overall project objectives include: To utilized analytical results to characterize the soil on Site for disposal and soil blending calculation purposes in view of potential Removal Action activities.

Who will use the data? Data will be used by EPA, Region II OSC.

5. Develop the Analytic Approach:

Analytical Techniques:
Soil/Aqueous (Rinsate Blank), radiological parameter: Gamma spectroscopy by EPA Method 901.1, alpha spectroscopy by HASL 300/GA-01-R, other gamma emitting radioisotopes by HASL-300/A-01-R.

Soil/Aqueous (Rinsate Blank), full TAL parameters: TAL Metals (SW-846 6010D, 7470A/7471B), Hg (SW-846 7471B), CN (SW-846 9012B), TAL VOCs (SW-846 8260C), TAL SVOCs (SW-846 8270D), TAL Pesticides (SW-846 8081A) PCBs (SW-846 8082A), Herbicides (SW-846 8151A).

Soil, full TCLP parameters: TCLP Metals including mercury (SW-846 6010D), TCLP VOCs (SW-846 8260C), TCLP SVOCs (SW-846 8270D), TCLP Pesticides (SW-846 8081A), TCLP Herbicides (SW-846 1311/8151A), RCRA Characteristics (SW-846 9012B, 9034, 1030, 9045D)

Type of Data: Definitive data

Matrix: Soil, Aqueous (Rinsate blanks)

Parameters:
Up to two composite waste characterization soil samples, including QA/QC samples, for TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including mercury, and RCRA characteristics.

Up to three grab waste characterization soil samples, including QA/QC samples, for TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including mercury, cyanide, and herbicides.

Up to three grab waste characterization soil samples, including QA/QC samples, and up to 31 grab soil samples for soil blending calculations, including QA/QC samples, for radiochemistry:

Gamma Spectrometry – homogenized with 21-day ingrowth

- Ra-226 using Bi-214 and/or Pb-214 (if only one progeny radionuclide is used, either Bi-214 or Pb-214, provide the other radionuclide's activity)
- From the Uranium Decay Chain: Th-234, Pa-234m
- From the Thorium Decay Chain: Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, Tl-208
- Other gamma emitting radionuclides: Cs-137 and K-40

QAPP Worksheet #11: Project/Data Quality Objectives (Continued)

Alpha Spectrometry – total dissolution of the sample to ensure complete homogenization of dense, rock-like contaminant in sample

- Isotopic Uranium: U-233/234, U-235/236, U-238
- Isotopic Thorium: Th-230, Th-232, Th-228

Isotopic Uranium/Thorium:

- Isotopic Uranium: U-233/234, U-235/236, U-238
- Isotopic Thorium: Th-232, and Th-230 if possible

Up to two rinsate blanks for TAL VOCs, SVOCs, PCBs herbicides, pesticides, and TAL metals including mercury, cyanide, and radiochemistry (gamma spectrometry, alpha Spectrometry, and other gamma emitting radionuclides).

Sampling Equipment: Coring device, plastic scoops, glass sample jars, Encore samplers, 40 milliliters (mL) volatile organic analysis (VOA) vails, poly sample bottles, glass sample bottles, stainless-steel hand augers, and re-sealable plastic bags.

Access Agreement: Obtained by EPA, Region II OSC.

Sampling Locations: Sample locations will be identified by the EPA OSC.

How much data are needed? Up to three grab waste characterization soil samples, including QA/QC samples, for radiological parameter, TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including mercury, cyanide, herbicides, analyses. Up to two waste characterization soil samples, including QA/QC samples, for TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including mercury, and RCRA characteristics, analyses. Up to 31 soil samples, including QA/QC samples, for radiological parameter analysis and soil blending calculations purposes. Up to two rinsate blanks for radiological parameter, TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including mercury, cyanide, herbicides, analyses.

6. Specify Performance or Acceptance Criteria:

How "good" does the data need to be in order to support the environmental decision?
Sampling/analytical measurement performance criteria (MPC) for Precision, Accuracy, Representativeness, Completeness, and Comparability (PARCC) parameters will be established. Refer to Worksheet #12, criteria for performance measurement for definitive data.

Where, when, and how should the data be collected/generated?
Up to three grab waste characterization soil samples, including QA/QC samples, for radiochemistry, TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including mercury, cyanide, and herbicides, analyses. Up to two composite waste characterization soil samples, including QA/QC samples, for TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals, including mercury, and RCRA characteristics, analyses. Up to 31 grab soil samples, including QA/QC, for radiochemistry and soil blending calculations. The sampling event is scheduled to beginning on December 1, 2020. All field and sampling activities will be performed in accordance with methods outlined in EPA's Environmental Response Team (ERT)/

QAPP Worksheet #11: Project/Data Quality Objectives (Concluded)

Scientific Engineering Response and Analytical Services (SERAS) contractor's Standard Operating Procedures (SOPs) and the Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM).

7. Develop the Detailed Plan for Obtaining Data

Who will collect and generate the data?
START V will collect all the soil samples. Eurofins TestAmerica (TestAmerica) will analyze all the soil samples and generate the analytical data. Soil analytical data for radiological parameters will be validated by a subcontracted Certified Health Physicist (CHP). Soil analytical data for all other parameters analyzed by TestAmerica will be validated by the START V data validator.

How will the data be reported? All data will be reported by the assigned laboratory (Preliminary, Electronic, and Hard Copy format). The Site Project Manager will provide a Sampling Trip Report, Status Reports, Maps/Figures, Analytical Report, and Data Validation Report to the EPA OSC.

How will the data be archived? Electronic data deliverables will be archived in a Scribe database. Non-CLP data will be archived in EPA's document control room.

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12A: Gamma Spectroscopy by EPA Method 901.1 (Non-CLP Worksheet)

Matrix: Soil /Aqueous (Rinse Blank)[1]
Analytical Group/Method: Radiochemistry (Gamma Spectroscopy)
Concentration Level: Low/Medium (Activity per Gram)

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Bias/Contamination	Method Blank	No radionuclides detected above the target detection limit (MDC)
Accuracy/Bias	LCS	Recovery limits as specified in Worksheet #28A
Precision	Sample Duplicate	RPD Limit of 40% or Normalized Difference < 3

[1]Aqueous samples are rinse blank and field duplicate and MS/MSD analyses are not required

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12B: Alpha Spectroscopy - HASL 300 A-01-R (Non-CLP Worksheet)

Matrix: Soil /Aqueous (Rinse Blank)[1]
Analytical Group/Method: Radiochemistry (Alpha Spectroscopy)
Concentration Level: Low/Medium (Activity per Gram)

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Bias/Contamination	Method Blank	No radionuclides detected above the target detection limit (MDC)
Accuracy/Bias	LCS	Recovery limits as specified in Worksheet #28B
Precision	Sample Duplicate	RPD Limit of 40% or Normalized Difference < 3
Accuracy/Bias	Tracer (every sample)	Recovery limits of 30-110%

[1]Aqueous samples are rinse blank and field duplicate and MS/MSD analyses are not required

QAPP Worksheet #12: Measurement Performance Criteria (Continued)
QAPP Worksheet #12C: TAL VOCs – Soil (Non-CLP Worksheet)

Matrix: Soil/Aqueous (Rinsate Blank), TAL/TCLP Leachate
Analytical Group/Method: TAL VOCs / SW-846 8260C
Concentration Level: Low

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Precision - Overall	Field Duplicates: 1 per 20 field samples	Soil RPD: ≤50%
Precision - Laboratory	MS/MSD	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples (Full list LCS is required for EPA 8260B/C)	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and/or laboratory SOP	%R within statistically-derived control limits developed by the laboratory
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank for EPA 8260B/C: 1 per 12- hour shift Instrument blank (all methods): after samples with analytes exceeding the instrument calibration range or detector saturation	EPA 8260B/C Blanks: ▪ Method: analyte concentrations <MDL or <5% of regulatory limit or <5% of the sample result for the analyte, whichever is greater ▪ Instrument: analyte concentrations < MDL ▪ Storage: not required; trip blank results may be used to monitor for contamination during storage Storage: none, refer to field reagent blank
Overall Accuracy/Bias (Contamination)	Field Blanks include: None	Not applicable
Sensitivity (method)	Review Laboratory RLs and MDLs	Action Level at least 3 to 10x > CRQL or RL

QC Samples for VOCs by GC/MS are listed along with their method-specified frequency and MPCs
[1]Laboratory may use/develop in-house QC

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12D: Semivolatile Organic Compounds (SVOCS) (Non-CLP Worksheet)

Matrix: Soil/Aqueous (Rinsate Blank), TAL/TCLP Leachate
Analytical Group/Method: TAL SVOCs / SW-846 8270D
Concentration Level: Low

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Precision - Overall	Field Duplicates: 1 per 20 field samples	Soil RPD: ≤50%
Precision - Laboratory	MS/MSD[2]	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of each matrix (Full list LCS is required for EPA 8270C/D)	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	One set per extraction batch when sufficient sample volume is provided or as requested per client
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and laboratory SOP	EPA 8270C/D: %R within statistically-derived control limits developed by the laboratory
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank (all methods): 1 per extraction batch of 20 samples Instrument blank (all methods): run after high concentration samples or detector saturation	EPA 8270C/D Blanks: • Method: analyte concentrations <MDL or <5% of regulatory limit or <5% of the sample result for the analyte, whichever is greater • Instrument: analyte concentrations < MDL
Overall Accuracy/Bias (Contamination)	Field Blanks include: None	Not Applicable
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

[1]Laboratory may use/develop in-house QC

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12E: Organochlorine (OC) Pesticides by GC/ECD (Non-CLP Worksheet)

Matrix: Soil/Aqueous (Rinsate Blank), TAL/TCLP Leachate
Analytical Group/Method: TCL Pesticides / SW-846 8081B
Concentration Level: Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Precision - Overall	Field Duplicates: 1 per 20 field samples	Soil RPD: ≤50%
Precision - Laboratory	MS and MSD (all pesticide methods): 1 per 20 samples of each matrix	EPA 8081B: RPDs within statistically derived laboratory acceptance limits
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of each matrix	EPA 8081B: %R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	EPA 8081B: %R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and laboratory SOP	EPA 8081B: %R within statistically derived laboratory acceptance limits
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank (all methods): 1 per extraction batch Instrument blank (EPA 8081B): as specified by method	EPA 8081B Blanks: • Method: analyte concentrations <MDL or <5% of regulatory limit or <5% of the sample result for the analyte, whichever is greater • Instrument: analyte concentrations < MDL
Overall Accuracy/Bias (Contamination)	Field Blanks include: None	Not applicable
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

[1]Laboratory may use/develop in-house QC

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12F: Polychlorinated Biphenyls (PCBs) as Aroclors by GC/ECD (Non-CLP Worksheet)

Matrix: Soil/Aqueous (Rinsate Blank), TAL
Analytical Group/Method: Aroclors (PCBs) / SW-846 8082A
Concentration Level: Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria[1]
Precision - Overall	Field Duplicates: 1 per 20 field samples	Soil RPD: ≤50%
Precision - Laboratory	MS and MSD (all PCB methods): 1 per 20 samples of each matrix	EPA 8082A: RPDs within statistically derived laboratory acceptance limits
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of each matrix	EPA 8082A: %R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	EPA 8082A: %R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and laboratory SOP	EPA 8082A: %R within statistically derived laboratory acceptance limits
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Instrument blank (all methods): At the frequency specified in EPA Method and/or after high concentration samples	EPA 8082A Blanks: • Method: analyte concentrations <MDL or <5% of regulatory limit or <5% of the sample result for the analyte, whichever is greater • Instrument: analyte concentrations < MDL
Overall Accuracy/Bias (Contamination)	Field Blanks include: None	Not applicable
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

[1]Laboratory may use/develop in-house QC

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12G: Chlorinated Herbicides by GC/ECD (Non-CLP Worksheet)

Matrix: Soil/Aqueous (Rinsate Blank),TCLP Leachate
Analytical Group/Method: Herbicides/ SW-846 8151A
Concentration Level: Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (soil matrix; not required for TCLP leachate)	Soil RPD: ≤50%
Precision – Laboratory	MS and MSD: 1 per 20 samples of each matrix	RPDs within statistically derived laboratory acceptance limits
Accuracy/Bias - Laboratory	LCS: 1 per extraction batch of up to 20 samples of each matrix (*Full list spike is required)*	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory (matrix interference)	MS/MSD: 1 per 20 samples of each matrix	%R within statistically derived laboratory acceptance limits
Accuracy/Bias – Laboratory	Surrogates added to each field and QC sample as specified by the method and laboratory SOP	%R within statistically derived laboratory acceptance limits
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per extraction batch Instrument blank: After high concentration samples TCLP/SPLP LEB: 1 per extraction batch of 20 samples	EPA 8151A Blanks: • Method: analyte concentrations <MDL or <5% of regulatory limit or <5% of the sample result for the analyte, whichever is greater • Instrument: analyte concentrations < MDL • TCLP/SPLP LEB: required but no acceptance criteria
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank	All analyte concentrations < CRQL or RL
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits [2]	Action Level at least 3 to 10x > RL

[1]Laboratory may use/develop in-house QC

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12H: Metals and Mercury (Non-CLP Worksheet)

Matrix: Soil/Aqueous (Rinsate Blank), TAL/TCLP Leachates
Analytical Group/Method: Metals and Mercury / SW-846 6010D/7471B
Concentration Level: Low

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (Required for soil; not required for TCLP leachates)	Soil RPD: ≤50%
Precision - Laboratory	Lab Duplicate: (Required for soil; not required for TCLP leachates)	Other methods: RPD within statistically-derived control limits developed by the laboratory
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples of similar matrix. (NOTE: LCS is required for other mercury methods.)	Other Methods: %R within statistically-derived control limits developed by the laboratory
Accuracy/Bias – Laboratory (matrix interference)	MS: (Required for soil; not required for TCLP leachates)	Other methods: %R within statistically-derived control limits developed by the laboratory
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per digestion batch Instrument blank: at beginning of analytical run (ICB), and after every 10 analytical samples (CCB) TCLP LEB: 1 per extraction batch of 20 samples	Other Methods: • Method: analyte concentrations <1/10 the Lower Limit of Quantitation check standard or <10% of regulatory limit or <10% of the lowest sample concentration in the preparation batch, whichever is greater • Instrument: analyte concentrations < established lower limit of quantitation • TCLP/SPLP LEB: required but no acceptance criteria
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank	All analyte concentrations < CRQL (ISM02.4) or RL (other methods)
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

Metals methods include Inductively-Coupled Plasma-Atomic Emission Spectroscopy (ICP-AES), Inductively-Coupled Plasma-Mass Spectroscopy (ICP-MS), and Cold Vapor Atomic Absorption (CVAA).
[1]Laboratory may use/develop in-house QC criteria

QAPP Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12I: Total Cyanide (Non-CLP Worksheet)

Matrix: Soil/Aqueous (Rinsate Blank)
Analytical Group/Method: Total Cyanide /SW-846 9012B
Concentration Level: Low/Medium

Data Quality Indicators (DQIs)	QC Sample or Measurement Performance Activity	Measurement Performance Criteria
Precision - Overall	Field Duplicates: 1 per 20 field samples (Required for soil matrix)	Soil RPD: ≤50%
Precision - Laboratory	Lab Duplicate: (Required for soil)	Other methods: RPD within statistically-derived control limits developed by the laboratory
Accuracy/Bias - Laboratory	LCS: 1 per analysis batch of up to 20 samples (NOTE: A "distilled ICV" is required for cyanide by ISM02.4 but an LCS is required for other cyanide methods.)	Other methods: %R within statistically-derived control limits developed by the laboratory
Accuracy/Bias – Laboratory (matrix interference)	MS: (Required for water, drinking water, and soil/sediment; not required for Solid or Waste)	Other methods: %R within statistically-derived control limits developed by the laboratory
Accuracy/Bias (Laboratory Contamination)	Laboratory Blanks include: Method blank: 1 per distillation batch Instrument blank: at beginning of analytical run (ICB), and after every 10 analytical samples (CCB)	Other Methods: • Method: analyte concentrations <1/10 the Lower Limit of Quantitation check standard or <10% of regulatory limit or <10% of the lowest sample concentration in the preparation batch, whichever is greater • Instrument: analyte concentrations < established lower limit of quantitation
Overall Accuracy/Bias (Contamination)	Field Blanks include: Equipment Blank	All analyte concentrations < CRQL (ISM02.4) or RL (other methods)
Sensitivity (method)	Review Laboratory RLs and MDLs against action limits	Action Level at least 3 to 10x > CRQL or RL

[1]Laboratory may use/develop in-house QC criteria

Worksheet #12: Measurement Performance Criteria Table
QAPP Worksheet #12I: Resource Conservation and Recovery Act (RCRA) Characteristics (Non-CLP Worksheet)

Matrix: Soil

Analytical Group: Reactivity (RCRA Characteristics)

Concentration Level: Low

Data Quality Indicators (DQIs)	Measurement Performance Criteria[1]	QC Sample and/or Activity Used to Assess Measurement Performance
Precision (field)	Project-Specific 50 %RPD	Field Duplicate
Precision (laboratory)	Project-Specific 20%RPD; List compound specific RPD	Laboratory Duplicate
Accuracy (laboratory)	List compound specific %R	MS/MSD

[1] Note: Above measurement performance criteria can be changed based on laboratory in-house QC limits.
MS/MSD analysis not required for pH and ignitability

QAPP Worksheet #13: Secondary Data Criteria and Limitations

Data Type	Data Source (Originating Organization, Report Title, and Date)	Data Uses Relative to Current Project	Factors Affecting the Reliability of Data and Limitations on Data Use
Removal Assessment Report, Area 6 and 7	Weston Solutions Inc., Removal Assessment Sampling report, September 2019, DC No. STARTV-01-D-0065	Removal Assessment sampling report for Area 6 and 7	None

QAPP Worksheet #14 & 16: Project Tasks and Schedules

Activity	Responsible Party	Planned Start Date	Planned Completion Date	Deliverable(s)	Deliverable Due Date
Develop Project-Specific Health and Safety Plan (HASP)	WESTON	10/19/2020	10/23/2020	HASP	10/23/2020
Develop Project-Specific QAPP/Revisions	WESTON	10/20/2020	11/2/2020	QAPP	11/2/2020
Coordination with EPA Region II RSCC for Regional or CLP analytical support or procure WESTON-subcontracted laboratory for analytical services	WESTON	10/19/2020	10/20/2020	Region II RSCC documentation (laboratory assignment) or WESTON Purchase Order for analytical services	NA
Scoping meeting Operations Manager, SPM, HSO, and sampling team to discuss data collection activities, objectives, and logistics	WESTON	10/19/2020	10/19/2020	Meeting Notes	NA
Mobilization/Demobilization	WESTON	11/8/2020	11/13/2020	Field Notes	NA
Sample Collection Tasks	WESTON	11/9/2020	11/13/2020	Field Notes	NA
Analytical Tasks	WESTON	11/16/2020	11/23/2020	Field Notes/Laboratory Reports	11/23/2020
Quality Control Tasks	WESTON	11/9/2020	12/7/2020	Report of Analyses/Data Package	12/7/2020
Data Validation	WESTON	12/7/2020	12/21/2020	Validation Summary Report	12/1212020
Summarize Data	WESTON	12/7/2020	12/21/2020	Project-Specific Summary Report/Table	12/21/2020
Develop Project-Specific Report	WESTON	12/21/2020	1/4/2021	Draft Project-Specific Report	1/4/2021
Address EPA comments on Draft Project-Specific Report	WESTON	1/11/2021	1/15/2021	Project-Specific Report	1/15/2021
Contract Closeout	WESTON	6/30/2020	6/30/2021	Contract Closeout Report	6/30/2021

Note: All dates listed above are approximate dates, actual deliverable will be provided based on sampling date and the date analytical data will be received from the lab.
NA – Not Applicable

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Continued)

Sampling Tasks:

START V is tasked with providing field sampling support as part of initial Removal Action activities in residential AOCs, including Area 6 and Area 7, associated with the Site. Two soil sampling locations will be selected on-site at the AOCs by the EPA OSC based on the results of a previous radiological survey conducted at the Site. Utilizing a coring device, START V will core through the surface concrete or asphalt to expose the underlying soil at the selected sampling locations. Utilizing non-dedicated stainless-steel hand augers, borings will be advanced at the cored locations to depths up to 24 inches bgs. START V will collect three grab soil samples comprising soil/rocks/slag, including QA/QC samples, from depths bgs. as directed by the EPA OSC from the two sampling locations. Sample depth intervals will be biased to depths where gamma readings exceed 2x background. The three grab soil samples, including QA/QC samples, will be submitted for laboratory radiochemistry, TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including mercury, cyanide, and herbicides, analyses. Two composite soil samples, including QA/QC samples, will be collected from both sampling locations, and submitted for laboratory TCLP VOCs, TCLP SVOCs, TCLP pesticides, TCLP herbicides, and TCLP metals including mercury, and RCRA characteristics, analyses. The three grab soil samples, including QA/QC samples and two composite soil samples, including QA/QC samples, are being collected for waste characterization purposes. Up to 31 soil/rocks/slag samples, including QA/QC samples, will be collected from four additional locations in the driveway of Area 6, two additional locations in the garage of Area 7, and any other location of interest, as determined by the EPA OSC. The additional soil samples will be collected from each sampling location at depth 0-6, 6-12, 12-18, and 18-24 inches bgs. The additional soil samples are being collected for soil blending calculations purposes and will be submitted to the assigned laboratory for radiochemistry analysis. A rinsate blank will be collected daily and submitted for laboratory TAL VOCs, TAL SVOCs, TAL pesticides, TAL PCBs, TAL metals including mercury, cyanide, herbicides, and radiochemistry, analyses.

Analysis Tasks:

Soil/Aqueous (Rinsate Blank): radiological parameter: Gamma spectroscopy by EPA Method 901.1, alpha spectroscopy by HASL 300/GA-01-R, other gamma emitting radioisotopes by HASL-300/A-01-R, and isotopic thorium/uranium by SW846 Method 6020A.

Soil/Aqueous (Rinsate Blank): full TAL parameters: TAL Metals (SW-846 6010D, 7470A/7471B), Hg (SW-846 7471B), CN (SW-846 9012B), TAL VOCs (SW-846 8260C), TAL SVOCs (SW-846 8270D), TAL Pesticides (SW-846 8081A) PCBs (SW-846 8082A), Herbicides (SW-846 8151A),

Soil: full TCLP parameters: TCLP Metals including Hg (SW-846 6010D), TCLP VOCs (SW-846 8260C), TCLP SVOCs (SW-846 8270D), TCLP Pesticides (SW-846 8081A), TCLP Herbicides (SW-846 131/8151A), RCRA Characteristics (SW-846 9012B, 9034, 1030, 9045D).

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Continued)

Decontamination: Non-dedicated sampling equipment will be utilized for sample collection; therefore, decontamination of non-dedicated sampling equipment is necessary, and will include Alconox detergent and potable water scrub, potable water rinse, and air dry.

Quality Control Tasks: The soil and rinsate samples will be analyzed for definitive data deliverable. For QA/QC purposes, field duplicate and additional sample volumes designated as MS/MSD, will be collected at the rate of one per 20 field samples. MS/MSD analysis is not required for pH and ignitability analyses. One rinsate blank will be collected daily to demonstrate adequacy of the decontamination of non-dedicated sampling equipment.

Data Management Tasks: Activities under this project will be reported in status and trip reports and other deliverables (e.g., analytical reports, final reports) described herein. Activities will also be summarized in appropriate format for inclusion in monthly and annual reports. The following deliverables will be provided under this project:

Trip Report: A trip report will be prepared to provide a detailed accounting of what occurred during each sampling mobilization. The trip report will be prepared within two weeks of the last day of each sampling mobilization. Information will be provided on time of major events, dates, and personnel on-site (including affiliations).

Maps/Figures: Maps depicting site layout, contaminant source areas, and sample locations will be included in the trip report, as appropriate.

Analytical Report: An analytical report will be prepared for samples analyzed under this plan. Information regarding the analytical methods or procedures employed, sample results, QA/QC results, chain-of-custody documentation, laboratory correspondence, and raw data will be provided within this deliverable.

Data Review: A review of the data generated under this plan will be undertaken. The assessment of data acceptability or usability will be provided separately, or as part of the analytical report.

Documentation and Records:

All sample documents will be completed legibly, in ink. Any corrections or revisions will be made by lining through the incorrect entry and by initialing the error.

Field Logbook: The field logbook is essentially a descriptive notebook detailing site activities and observations so that an accurate account of field procedures can be reconstructed in the writer's absence. Field logbook will be bound and paginated. All entries will be dated and signed by the individuals making the entries, and should include (at a minimum) the following

1. Site name and project number
2. Name(s) of personnel on-site
3. Dates and times of all entries (military time preferred)
4. Descriptions of all site activities, site entry and exit times
5. Noteworthy events and discussions

QAPP Worksheet #14 & 16: Project Tasks and Schedules (Concluded)

6. Weather conditions
7. Site observations
8. Sample and sample location identification and description*
9. Subcontractor information and names of on-site personnel
10. Date and time of sample collections, along with chain of custody information
11. Record of photographs
12. Site sketches

* The description of the sample location will be noted in such a manner as to allow the reader to reproduce the location in the field at a later date.

Sample Labels: Sample labels will clearly identify the particular sample, and should include the following:

1. Site/Project number
2. START V Sample identification number.
3. Sample collection date and time
4. Analytical Parameters
5. Sample preservation

Sample labels will be written in indelible ink and securely affixed to the sample container. Tie-on labels can be used if properly secured.

Custody Seals: Custody seals demonstrate that a sample container has not been tampered with or opened. The individual in possession of the sample(s) will sign and date the seal, affixing it in such a manner that the container cannot be opened without breaking the seal. The name of this individual, along with a description of the sample packaging, will be noted in the field logbook.

Assessment/Audit Tasks: No performance audit of field operations is anticipated at this time. If conducted, performance and system audit will be in accordance with the project plan.

Data Review Tasks: All non-CLP data will be validated by the START V data validators/CHP.

The data generated under this QA/QC Sampling Plan will be evaluated according to guidance in the Uniform Federal Policy for Implementing Environmental Quality Systems: Evaluating, Assessing and Documenting Environmental Data Collection and Use Programs Part 1: UFP-QAPP (EPA-105-B-04-900A, March 2005); Part 2B: Quality Assurance/Quality Control Compendium: Minimum QA/QC Activities (EPA-105-B-04-900B, March 2005). Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity.

Laboratory analytical results will be assessed by the data reviewer for compliance with required precision, accuracy, completeness, representativeness, and sensitivity.

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits
Worksheet #15A – Soil Radiological Parameters

Matrix: Soil
Analytical Group: Gamma Spec-GA-01-R/Alpha Spec-a-01-R
Concentration Level: Low/Medium

Analyte	CAS Number	Site-Specific Action Level (pCi/g)	Laboratory Method Detection/Quantitation Limits (mg/L)
Gamma Spec – GA-01-R – pCi/g			
Actinium 228	14331-83-0	207,000	1.00
Bismuth-212	14913-49-6	10,400,000	3.00
Bismuth-214	14733-03-0	2,110,000	1.00
Cesium-137	10045-97-3	18	0.200
Lead-212	15092-94-1	1,060,000	0.300
Lead-214	15067-28-4	11,800,000	1.00
Potassium-40	13966-00-2	43	1.50
Protactinium-234	378783-76-7	116,000	1.50
Radium-224	13233-32-4	1,400,000	5.00
Radium-226	13982-63-3	4.06	1.00
Radium-228	15262-20-1	26.3	1.00
Thallium-208	14913-50-9	5,470,000	0.200
Thorium-234	15065-10-8	76,700	4.00
Isotopic Uranium (Alpha Spec) – A-01-R – pCi/g			
Uranium-233/234	13966-29-5	10,300	1.00
Uranium-235/236	15117-96-1	60.9	1.00
Uranium-238	7440-61-1	11,700	1.00
Isotopic Thorium (Alpha Spec) – A-01-R – pCi/g			
Thorium-228	14274-82-9	31,000	1.00
Thorium-230	14269-63-7	6,160	1.00
Thorium-232	7440-29-1	6,260	1.00

Note: There are no EPA Site-Specific Action Levels for aqueous samples.
pCi/g – Picocuries per gram

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15B: TAL VOCs – Soil (Non-CLP Worksheet)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: TAL VOCs
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level	Laboratory Method Detection/Quantitation Limits
1,1,1-Trichloroethane	71-55-6	See Attachment C	See Attachment D
1,1,2,2-Tetrachloroethane	79-34-5		
1,1,2-Trichloroethane	79-00-5		
1,1,2-Trichlorotrifluoroethane	76-13-1		
1,1-Dichloroethane	75-34-3		
1,1-Dichloroethene	75-35-4		
1,2,3-Trichlorobenzene	87-61-6		
1,2,4-Trichlorobenzene	120-82-1		
1,2-Dibromo-3-chloropropane	96-12-8		
1,2-Dibromoethane	106-93-4		
1,2-Dichlorobenzene	95-50-1		
1,2-Dichloroethane	107-06-2		
1,2-Dichloropropane	78-87-5		
1,3-Dichlorobenzene	541-73-1		
1,4-Dichlorobenzene	106-46-7		
2-Butanone	78-93-3		
2-Hexanone	591-78-6		
4-Methyl-2-pentanone	108-10-1		
Acetone	67-64-1		
Benzene	71-43-2		
Bromochloromethane	74-97-5		
Bromodichloromethane	75-27-4		
Bromoform	75-25-2		
Bromomethane	74-83-9		
Carbon disulfide	75-15-0		
Carbon tetrachloride	56-23-5		
Chlorobenzene	108-90-7		
Chlorodibromomethane	124-48-1		
Chloroethane	75-00-3		
Chloroform	67-66-3		
Chloromethane	74-87-3		
cis-1,2-Dichloroethene	156-59-2		
cis-1,3-Dichloropropene	10061-01-5		
Cyclohexane	110-82-7		
Dichlorodifluoromethane	75-71-8		
Ethyl Benzene	100-41-4		
Hexachlorobutadiene	87-68-3		
Hexachloroethane	67-72-1		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15B: TAL VOCs – Soil (Non-CLP Worksheet) (Concluded)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: TAL VOCs
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level	Laboratory Method Detection/Quantitation Limits
Isopropylbenzene	98-82-8	See Attachment C	See Attachment D
Methyl Cyclohexane	108-87-2		
Methyl tert-butyl Ether	1634-04-4		
Methylene chloride	75-09-2		
o-xylene	95-47-6		
Styrene	100-42-5		
t-1,3-Dichloropropene	10061-02-6		
Tetrachloroethene	127-18-4		
Toluene	108-88-3		
Trans-1,2-dichloroethene	156-60-5		
Trichloroethene	79-01-6		
Trichlorofluoromethane	75-69-4		
Vinyl chloride	75-01-4		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15C: TAL SVOCs – Soil (Non-CLP Worksheet)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: TAL SVOCs
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level	Laboratory Method Detection/Quantitation Limits
1,1-Biphenyl	92-52-4	See Attachment C	See Attachment D
1,2,4,5-Tetrachlorobenzene	95-94-3		
1,4-Dioxane	123-91-1		
2,2-oxybis(1-Chloropropane) {Bis(2-chloroisopropyl) Ether}	108-60-1		
2,3,4,6-Tetrachlorophenol	58-90-2		
2,4,5-Trichlorophenol	95-95-4		
2,4,6-Trichlorophenol	88-06-2		
2,4-Dichlorophenol	120-83-2		
2,4-Dimethylphenol	105-67-9		
2,4-Dinitrophenol	51-28-5		
2,4-Dinitrotoluene	121-14-2		
2,6-Dinitrotoluene	606-20-2		
2-Chloronaphthalene	91-58-7		
2-Chlorophenol	95-57-8		
2-Methylnaphthalene	91-57-6		
2-Methylphenol	95-48-7		
2-Nitroaniline	88-74-4		
2-Nitrophenol	88-75-5		
3,3-Dichlorobenzidine	91-94-1		
3+4-Methylphenols (3-Methylphenol and 4-Methyl phenol)	65794-96-9		
3-Nitroaniline	99-09-2		
4,6-Dinitro-2-methylphenol	534-52-1		
4-Bromophenyl-phenylether	101-55-3		
4-Chloro-3-methylphenol	59-50-7		
4-Chloroaniline	106-47-8		
4-Chlorophenyl-phenylether	7005-72-3		
4-Nitroaniline	100-01-6		
4-Nitrophenol	100-02-7		
Acenaphthene	83-32-9		
Acenaphthylene	208-96-8		
Acetophenone	98-86-2		
Anthracene	120-12-7		
Atrazine	1912-24-9		
Benzaldehyde	100-52-7		
Benzo(a)anthracene	56-55-3		
Benzo(a)pyrene	50-32-8		
Benzo(b)fluoranthene	205-99-2		
Benzo(g,h,I)perylene	191-24-2		
Benzo(k)fluoranthene	207-08-9		
bis(2-Chloroethoxy)methane	111-91-1		
bis(2-Chloroethyl)ether	111-44-4		
bis(2-Ethylhexyl)phthalate	117-81-7		
Butylbenzylphthalate	85-68-7		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15C: TAL SVOCs – Soil (Non-CLP Worksheet) (Continued)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: TAL SVOCs
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level	Laboratory Method Detection/Quantitation Limits
Caprolactam	105-60-2	See Attachment C	See Attachment D
Carbazole	86-74-8		
Chrysene	218-01-9		
Dibenzo(a,h)anthracene	53-70-3		
Dibenzofuran	132-64-9		
Diethylphthalate	84-66-2		
Dimethylphthalate	131-11-3		
Di-n-butylphthalate	84-74-2		
Di-n-octyl phthalate	117-84-0		
Fluoranthene	206-44-0		
Fluorene	86-73-7		
Hexachlorobenzene	118-74-1		
Hexachlorobutadiene	87-68-3		
Hexachlorocyclopentadiene	77-47-4		
Hexachloroethane	67-72-1		
Indeno(1,2,3-cd)pyrene	193-39-5		
Isophorone	78-59-1		
Naphthalene	91-20-3		
Nitrobenzene	98-95-3		
N-Nitroso-di-n-propylamine	621-64-7		
n-Nitrosodiphenylamine	86-30-6		
Pentachlorophenol	87-86-5		
Phenanthrene	85-01-8		
Phenol	108-95-2		
Pyrene	129-00-0		
Caprolactam	105-60-2		
Carbazole	86-74-8		
Chrysene	218-01-9		
Dibenzo(a,h)anthracene	53-70-3		
Dibenzofuran	132-64-9		
Diethylphthalate	84-66-2		
Dimethylphthalate	131-11-3		
Di-n-butylphthalate	84-74-2		
Di-n-octyl phthalate	117-84-0		
Fluoranthene	206-44-0		
Fluorene	86-73-7		
Hexachlorobenzene	118-74-1		
Hexachlorobutadiene	87-68-3		
Hexachlorocyclopentadiene	77-47-4		
Hexachloroethane	67-72-1		
Indeno(1,2,3-cd)pyrene	193-39-5		
Isophorone	78-59-1		
Naphthalene	91-20-3		
Nitrobenzene	98-95-3		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15C: TAL SVOCs – Soil (Non-CLP Worksheet) (Concluded)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: TAL SVOCs
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level	Laboratory Method Detection/Quantitation Limits
N-Nitroso-di-n-propylamine	621-64-7	See Attachment C	See Attachment D
n-Nitrosodiphenylamine	86-30-6		
Pentachlorophenol	87-86-5		
Phenanthrene	85-01-8		
Phenol	108-95-2		
Pyrene	129-00-0		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15D: TAL Pesticides – Soil (Non-CLP Worksheet)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: TAL Pesticides
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level	Laboratory Method Detection/Quantitation Limits
4,4-DDD	72-54-8	See Attachment C	See Attachment D
4,4-DDE	72-55-9		
4,4-DDT	50-29-3		
Aldrin	309-00-2		
alpha-BHC	319-84-6		
alpha-Chlordane	5103-71-9		
beta-BHC	319-85-7		
delta-BHC	319-86-8		
Dieldrin	60-57-1		
Endosulfan I	959-98-8		
Endosulfan II	33213-65-9		
Endosulfan Sulfate	1031-07-8		
Endrin	72-20-8		
Endrin aldehyde	7421-93-4		
Endrin ketone	53494-70-5		
gamma-BHC (Lindane)	58-89-9		
gamma-Chlordane	5103-74-2		
Heptachlor	76-44-8		
Heptachlor epoxide	1024-57-3		
Methoxychlor	72-43-5		
Toxaphene	8001-35-2		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15E: PCBs – Soil (Non-CLP Worksheet)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: TAL PCBs
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level	Laboratory Method Detection/Quantitation Limits
Aroclor-1016	12674-11-2	See Attachment C	See Attachment D
Aroclor-1221	11104-28-2		
Aroclor-1232	11141-16-5		
Aroclor-1242	53469-21-9		
Aroclor-1248	12672-29-6		
Aroclor-1254	11097-69-1		
Aroclor-1260	11096-82-5		
Aroclor-1262	37324-23-5		
Aroclor-1268	11100-14-4		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15F: Herbicides – Soil (Non-CLP Worksheet)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: Herbicides
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level[1]	Laboratory Method Detection/Quantitation Limits
Dalapon	75-99-0	See Attachment C	See Attachment D
4-Nitrophenol	100-02-1		
Dicamba	1918-00-9		
Dichloroprop	120-36-5		
2,4-D	94-75-7		
Pentachlorophenol	87-86-5		
2,4,5-T-P (Silvex)	93-72-1		
2,4,5-T	93-76-5		
Dinoseb	88-85-7		
2,4-DB	94-82-6		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)

Worksheet #15G: TAL Metals including Hg and CN – Soil (Non-CLP Worksheet)

Matrix: Soil/Rock/Slag/Aqueous (Rinsate Blank)
Analytical Group: TAL Metals including Hg and CN
Concentration Level: Low/Medium

Analyte	CAS Number	Action Level	Laboratory Method Detection/Quantitation Limits
Aluminum	7429-90-5	See Attachment C	See Attachment D
Antimony	7440-36-0		
Arsenic	7440-38-2		
Barium	7440-39-3		
Beryllium	7440-41-7		
Cadmium	7440-43-9		
Calcium	7440-70-2		
Chromium	7440-47-3		
Cobalt	7440-48-4		
Copper	7440-50-8		
Iron	7439-89-6		
Lead	7439-92-1		
Magnesium	7439-95-4		
Manganese	7439-96-5		
Nickel	7440-02-0		
Potassium	7440-09-7		
Selenium	7782-49-2		
Silver	7440-22-4		
Sodium	7440-23-5		
Thallium	7440-28-0		
Vanadium	7440-62-2		
Zinc	7440-66-6		
Mercury	7439-97-6		
Cyanide	57-12-5		

QAPP Worksheet #15H: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Continued)
Worksheet #15H: RCRA Characteristics - SW-846 Methods

Matrix: Soil/Rock/Slag
Analytical Group: RCRA Characteristics
Concentration Level: Low/Medium

Analyte	CAS Number	Action Levels	Laboratory Method Detection/Quantitation Limits
Cyanide (soil)	NA	See Attachment C	See Attachment D
Ignitability (soil)	NA		
Sulfide (soil)	NA		
pH - soil and waste	NA		
Flash Point	NA		

QAPP Worksheet #15: Project Action Limits and Laboratory Specific Detection/Quantitation Limits (Concluded)
Worksheet #15I: Full TCLP– Soil (Non-CLP Worksheet)

Matrix: Soil/Rock/Slag
Analytical Group: Full TCLP
Concentration Level: Medium

TCLP COMPOUNDS	REGULATORY LEVEL mg/L	Laboratory Method Detection/Quantitation Limits
TCLP Volatiles		
1,1-Dichloroethene (1,1-DCE)	See Attachment C	See Attachment D
1,2-Dichloroethane (EDC)		
2-Butanone (Methyl ethyl ketone; MEK)		
Benzene		
Carbon Tetrachloride		
Chlorobenzene		
Chloroform		
Tetrachloroethene (PCE; PERC)		
Trichloroethene (TCE)		
Vinyl Chloride (VC)		
TCLP Semi-Volatiles		
2,4,5-Trichlorophenol	See Attachment C	See Attachment D
2,4,6-Trichlorophenol (TCP)		
1,4-Dichlorobenzene		
2,4-Dinitrotoluene (DNT)		
2-Methylphenol (o-Cresol)		
3+4-Methylphenol (m+p-Cresol)		
Hexachlorobenzene (HCB)		
Hexachlorobutadiene (HCBD)		
Hexachloroethane (HCE)		
Nitrobenzene		
Pentachlorophenol		
Pyridine		
TCLP Pesticides		
Chlordane	See Attachment C	See Attachment D
Endrin		
gamma-BHC (Lindane; gamma-HCH)		
Heptachlor		
Heptachlor epoxide		
Methoxychlor		
Toxaphene		
TCLP Herbicides		
2,4,5-TP (Silvex)	See Attachment C	See Attachment D
2,4-D		
TCLP METALS		
Arsenic	See Attachment C	See Attachment D
Barium		
Cadmium		
Chromium		
Lead		
Mercury		
Selenium		
Silver		

QAPP Worksheet #17: Sampling Design and Rationale

All field sampling activities will be conducted in accordance with EPA's ERT/SERAS contractor's SOP No. 2001: *General Field Sampling Guidelines*. Soil sampling will be conducted in accordance with EPA's ERT/SERAS contractor's SOP No. 2012: *Soil Sampling*, and EPA's *Multi-Agency Radiation Survey and Site Investigation Manual* (MARSSIM). Prior to mobilizing to the Site, START V will contact Dig Safely New York and request a mark-out of all subsurface public utilities located within the ROW areas near the AOCs. Two soil sampling locations will be selected on-site at the AOCs (Area 6 and Area 7) by the EPA OSC based on the results of a previous radiological survey conducted at the Site. Utilizing a coring device, START V will core through the surface concrete or asphalt to expose the underlying soil at the selected sampling locations. Utilizing non-dedicated stainless-steel hand augers, borings will be advanced at the cored locations to depths up to 24 inches bgs. START V will collect up to three samples comprising soil/rocks/slag, including QA/QC samples, from depths bgs. as directed by the EPA OSC at the two sampling locations. New nitrile gloves will be don between sampling locations and depth intervals.

At each of the two cored sampling locations, soil will be extracted with the non-dedicated stainless-steel hand augers at 6-inch intervals bgs. and placed in dedicated resealable plastic bags for homogenization. Each bagged soil will be screened for gamma radiation at a background location using Ludlum-2241 and NaI 3x3 scintillator, and screening data documented. Based upon screening data, sample collection will be biased to depth intervals where gamma readings exceed 2x background. At each sampling location and desired depth interval, discrete grab soil sample designated for TAL VOCs analysis will be collected first from the homogenized bagged soil using Encore samplers. Subsequently, discrete grab soil sample for and percent moisture, TAL SVOCs, TAL PCBs, TAL pesticides, TAL metals including Hg, CN, herbicides, and radiochemistry (gamma spectroscopy and alpha spectroscopy), analyses will be collected from the homogenized bagged soil using dedicated plastic scoop and transferred into designated laboratory glass sample containers. A total of two discrete soil samples, one field duplicate, and additional volumes of one soil sample, designated as MSMSD, will be collected laboratory analysis.

In addition, aliquots from both sampling locations will be collected from homogenized bagged soils that significantly exceeds background gamma reading and composited in a dedicated resealable plastic bag into a single sample. Composite soil sample for TCLP VOCs analysis will be collected first from the resealable plastic bag using Encores samplers. Subsequently, composite sample for TCLP SVOCs, TCLP pesticides, TCLP herbicides, TCLP metals including Hg, and RCRA characteristics, analyses will be collected in designated laboratory glass sample containers. A total of five soil samples comprising three grab soil samples, including one field duplicate, and the two composite soil samples, including one field duplicate, are being collected for waste characterization purposes.

Additionally, up to 31 soil/rocks/slag samples, including QA/QC samples, will be collected from four additional locations in the driveway of Area 6, two additional locations in the garage of Area 7, and any other location of interest, as determined by the EPA OSC. Utilizing a coring device, START V will core through the surface concrete or asphalt to expose the underlying soil at the selected sampling locations. Utilizing non-dedicated stainless-steel hand augers, borings will be

QAPP Worksheet #17: Sampling Design and Rationale (Continued)

advanced at each cored location to depths up to 24 inches bgs. At each boring location, soil samples will be collected from depths 0-6, 6-12, 12-18, and 18-24 inches bgs. Soil sample extracted with the stainless-steel hand auger will be placed into dedicated resealable plastic bag for homogenization. Each bagged soil sample will be screened for gamma radiation at a background location using Ludlum-2241 and NaI 3x3 scintillator, and screening data documented. Using dedicated plastic scoop, soil sample will be collected from each bag and transferred into designated laboratory glass sample containers. For QA/QC purposes, one field duplicate, and additional volumes of one field sample designated as MS/MSD, will be collected. All 31 soil samples, including QA/QC samples, will be submitted to the designated laboratory for radiochemistry (gamma spectroscopy and alpha spectroscopy) analysis. The 31 soil samples, including QA/QC samples, from the additional six locations are being collected for soil blending calculations purposes.

Decontamination of non-dedicated sampling equipment (*i.e.* coring device and stainless steel hand augers) will be performed in accordance with EPA's ERT/SERAS contractor's SOP No. 2006: *Sampling Equipment Decontamination*, and will include Alconox detergent and potable water scrub, potable water rinse, and air dry. One rinsate blank will be collected at the end of each sampling day to demonstrate adequacy of the decontamination of non-dedicated sampling equipment. Rinsate blank will be collected by pouring DI water over a properly decontaminated hand auger and collecting the rinse water in sample containers. The rinsate samples will be submitted for laboratory TAL VOCs, TAL SVOCs, TAL PCBs, TAL pesticides, TAL metals including mercury, cyanide, herbicides, and radiochemistry (gamma spectroscopy and alpha spectroscopy), analyses. Rinsate samples for TAL VOCs analysis will be collected in 40 milliliters (mL) volatile organic analysis (VOA) vails pre-preserved with hydrochloric acid. Rinsate samples for TAL metals including Hg analysis will be preserved with nitric acid pH less than (<) 2. Rinsate samples for CN analysis will be preserved with sodium hydroxide (NaOH) pH > 12.

All coring locations will be backfilled in reverse order with the excavated soil after sampling, tamped down, and restored with concrete mix. All sample information will be entered into the Site-Specific SCRIBE database from which chain of custody (COC) record and sample labels will be generated.

This sampling design is based on information currently available and may be modified on-site in light of field screening results and other acquired information.

QAPP Worksheet #17: Sampling Design and Rationale (Concluded)

The following laboratory will provide the analyses indicated:

Lab Name/Location	Sample Type	Parameters
Eurofins TestAmerica Laboratories, Inc. 13715 Rider Trail North Earth City, MO 63045 Contact: Mike Franks Call: (314) 787-8201 RFP# 636	Soil/Slag/Rocks	Gamma spectroscopy Th-234, Pa-234 or Pa-234m, Pb-214, and Bi-214 from the uranium decay chain. Ra-228 and/or Ac-228, Ra-224, Pb-212, Bi-212, and Tl-208 from the thorium decay chain. Other gamma emitting radioisotopes including Cs-137 and K-40, and Ra-226 using Bi-214 and/or Pb-214 **homogenized for 21 days ingrowth**. Alpha spectroscopy U-233/234, U-235/236, U-238, Th-230, Th-232, and Th-228. Full TAL TAL: VOCs, SVOCS, Pesticides, PCBs, Metals + Hg + CN, and Herbicides Full TCLP TCLP: VOCs, SVOCs, Pesticides, Herbicides, TCLP Metal + Hg, and RCRA Characteristics
	Aqueous	TAL: VOCs, SVOCS, Pesticides, PCBs, Metals + Hg + CN, Herbicides, alpha spectroscopy, gamma spectroscopy, other gamma emitting radioisotopes

Refer to Worksheet #20 for QA/QC samples, sampling methods, and SOPs.

QAPP Worksheet #18: Sampling Locations and Methods/SOP Requirements Table

The following information is project-specific and will be included in the site-specific QAPP.

Sampling Location	Matrix	(Units)	Sample Type No. of Samples (identify field duplicates)	Analyte/Analytical Group(s)	Sampling SOP Reference[1]	Comments
2	Soil/Rock/Slag	pCi/g	Grab, 2 samples (1)	Gamma spectrometry, Alpha Spectrometry, and Isotopic Uranium/Thorium	SOP# 2001, SOP# 2012, MARSSIM[2]	To characterize the soil for disposal purposes.
2	Soil/Rock/Slag	µg/kg mg/kg	Grab, 2 samples (1)	TAL: VOCs, SVOCs, Pesticides, PCBs, Metals + Hg, CN, Herbicides	SOP# 2001, SOP# 2012	
2	Soil/Rock/Slag	µg/kg mg/kg mg/L	Composite, 1 sample (1)	TCLP: VOCs, SVOCs, Pesticides, Metals, Herbicides	SOP# 2001, SOP# 2012	
31	Soil/Rock/Slag	pCi/g	Grab, 28 samples (2)	Gamma spectrometry, Alpha Spectrometry, and Isotopic Uranium/Thorium	SOP# 2001, SOP# 2012, MARSSIM[2]	For soil blending calculations
NA	Aqueous (Rinsate Blank)	mg/L	Grab, 2 samples	TAL: VOCs, SVOCs, Pesticides, PCBs, Metals + Hg, CN, Herbicides	SOP# 2001, SOP# 2006	To verify adequacy of decontamination of non-dedicated sampling equipment

[1]The website for EPA/ERT SOPs is: https://response.epa.gov/site/site_profile.aspx?site_id=2107
[2]The website for MARSSIM is: https://www.epa.gov/radiation/download-marssim-manual-and-resources

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times

Matrix	Analytical Group	Analytical and Preparation Method/SOP Reference[1]	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)	Data Package Turnaround Time
Soil/Rock/Slag	Gamma Spec	EPA 901.1 / ST-RD-0102	1x16oz. plastic or glass	None	None	21 days preliminary data 42 days final data
	Alpha Spec	HASL 300 A-01-R / ST-RD-0210	Included with Gamma spec	None	None	21 days preliminary data 42 days final data
	TAL VOCs / Percent Moisture	SW-846 8260C	(3) 5-gram Encore samplers / (1) 4 oz. jar with septum	Cool to 4°C	48 hours (from time of sample collection)	21 days Final data
	TAL SVOCs	SW-846 8270D	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	14 days extract; 40 days analyze	21 days Final data
	TAL Pesticides	SW-846 8081B	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	14 days extract; 40 days analyze	21 days Final data
	PCBs	SW-846 8082A	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	14 days extract; 40 days analyze	21 days Final data
	Herbicides	SW-846 8151A	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	14 days extract; 40 days analyze	21 days Final data
	TAL Metals, Hg, CN	SW-846 6010D	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	Metals - 180 days Hg - 28 days CN - 14 days	21 days Final data
	TCLP VOCs	SW-846 8260C	(3) 25-gram Encore samplers	Cool to 4°C	14 days (TCLP extraction to analysis)	21 days Final data
	TCLP SVOCs	SW-846 8270D	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	14 days extract; 40 days analyze	21 days Final data
	TCLP Pesticides	SW-846 8081B	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	14 days extract; 40 days analyze	21 days Final data
	TCLP Herbicides	SW-846 8151A	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	14 days extract; 40 days analyze	21 days Final data
	TCLP Metals + Hg	SW-846 6010D	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	Metals - 180 days, Hg - 28 days,	21 days Final data
	RCRA Characteristics	SW 846 Methods: 9012A, 9034, 1030, and 9045C	(1) 8 oz. clear glass jar w/ Teflon lined cap	Cool to 4°C	As soon as possible	21 days Final data

[1]The website for EPA's ERT/SERAS SOPs is: https://response.epa.gov/site/site_profile.aspx?site_id=2107

[2] The minimum sample size is based on analysis allowing for sufficient sample for reanalysis. Additional volume is needed for laboratory Matrix Spike/Matrix Spike Duplicate.

* No sample preservation is required, but sample containers should be completely filled and tightly sealed to preserve sample integrity.

QAPP Worksheet #19 & 30: Sample Containers, Preservation, and Hold Times (Concluded)

Matrix	Analytical Group	Analytical and Preparation Method/SOP Reference[1]	Containers (number, size, and type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/ analysis)	Data Package Turnaround Time
Rinsate Blanks	Gamma Spec	EPA 901.1 / ST-RD-0102	1 L poly bottle	None	None	21 days preliminary data 42 days final data
	Alpha Spec	HASL 300 A-01-R / ST-RD-0210		None	None	21 days preliminary data 42 days final data
	TAL SVOCs	SW-846 8270D	(2) 1 L amber glass bottle	Cool to 4°C	7 days to extraction, 40 days to analysis	14 days preliminary data, 42 days validated data
	PCBs	SW-846 8082A	(1) 1 L amber glass bottle	Cool to 4°C	7 days to extraction, 40 days to analysis	14 days preliminary data, 42 days validated data
	TAL Metals + Hg	SW-846 6010D/7470A	(1) 1-L HDPE bottle	HNO_3 to pH<2, Cool to ≤6ºC, not frozen	180 days, Hg-28 days	14 days preliminary data, 42 days validated data
	Cyanide	SW-846 9012B	(1) 1-L HDPE bottle	NaOH pH>12, Cool to ≤6ºC, not frozen	14 days	14 days preliminary data, 42 days validated data
	Herbicides	EPA 8151A	(2) 1-L amber glass with PTFE-lined lid	Cool to ≤6ºC, not frozen	7 days from sampling to extraction	40 days (extraction to analysis)

QAPP Worksheet #20: Field Quality Control Sample Summary

Matrix	Analytical Group	No. of Field Samples	No. of Field Duplicates	No. of Extra Volume Laboratory QC (e.g., MS/MSD) Samples	No. of Field Blanks	No. of Equip. Blanks	No. of Trip. Blanks	No of others	Total No. of Samples to Lab
Soil/Rock/Slag	Gamma spectrometry, Alpha Spectrometry, and Isotopic Uranium/Thorium	32	2	2	NR	NR	NR	NR	34
	TAL: VOCs, SVOCs, Pesticides, PCBs, Metals + Hg, CN, Herbicides	2	1	1	NR	NR	NR	NR	3
	TCLP: VOCs, SVOCs, Pesticides, Metals + Hg, Herbicides	1	1	1	NR	NR	NR	NR	2
Aqueous	TAL: VOCs, SVOCs, Pesticides, PCBs, Metals + Hg, CN, Herbicides Gamma spectrometry, Alpha Spectrometry, and Isotopic Uranium/Thorium	2	NR	NR	NR	NR	NR	NR	2

NR – Not Required

QAPP Worksheet #21: Project Sampling SOP References Table

Reference Number	Title, Revision Date and/or Number	Originating Organization	Equipment Type	Modified for Project Work? (Y/N)	Comment
SOP # 2001	General Field Sampling Guidelines (all media); Rev. 1.0, June 2013	EPA's ERT/SERAS	Plastic scoops, re-sealable plastic bags, and glass sample jars	N	NA
SOP#: 2006	Sample Equipment Decontamination; Rev. 0.1, December 28, 2015	ERT/SERAS	Poly bottles	N	NA
SOP # 2012	Soil Sampling; Rev.01, July 2001	EPA's ERT/SERAS	Plastic scoops, re-sealable plastic bags, and glass sample jars	N	NA
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual, August 2000	NUREG/EPA/DOE	Plastic scoops, re-sealable plastic bags, and glass sample jars	N	NA

See Attachment B for EPA's ERT/SERAS SOP #s 2001, 2012, and MARSSIM.
The website for EPA's ERT/SERAS SOPs is: https://response.epa.gov/site/site_profile.aspx?site_id=2107
The website for MARSSIM is: https://www.epa.gov/radiation/download-marssim-manual-and-resources

QAPP Worksheet #22: Field Equipment Calibration, Maintenance, Testing, and Inspection Table

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person	SOP Reference
Trimble® GeoXT™ handheld GPS	Factory-calibrated by Manufacturer	Charge battery when low	Confirm optimum satellite reception and battery status	Charge battery at least daily	For data accuracy, the unit should receive communication from at least 5 satellites	Charge battery when low or replace battery if it does not hold charge	EPA Equipment office	Not applicable
*Ludlum Model 2241 with 3x3 Gamma Scintillator	Factory-calibrated by Manufacturer	Replace battery when low	Turn on instrument to confirm sensitivity	As needed	Instrument reads background	EPA Equipment office	EPA Equipment office	Not applicable

*Equipment provided, calibrated, maintained, tested, and inspected by EPA.

QAPP Worksheet #23: Analytical SOPs

Reference Number	Title, Revision Date, and/or Number and URL (if available)	Definitive or Screening Data	Analytical Group	Instrument	Modified for Project Work? (Y/N) *
AP-011 AP-018AP-018	Gamma Spectroscopy Operation, Rev-20, 5/31/17 Operation of the Alpha Spectroscopy Systems Rev-19, 5/31/17	Definitive	Soil/Aqueous, Gamma Spectroscopy	Canberra	N
AP-002 & AP-005	Sample Preparation Rev21, 10/29/16 & Alpha Isotopic Analyses, Rev-20, 10/31/16	Definitive	Soil/Aqueous, Alpha Spectroscopy	Canberra	N
SW-846 6010D	Inductively Coupled Plasma – Optical Emission Spectrometry, July 2018, Rev. 5	Definitive	Soil/Aqueous, TAL/TCLP Metals	ICP-AES	N
SW-846 7471B	Mercury in Solid or Semisolid Waste (Manual Cold-Vapor Technique), January 1998, Rev. 2	Definitive	Soil/Aqueous, TAL/TCLP Mercury	CVAA	N
SW-846 9010C	Total and Amenable Cyanide: Distillation, November 2004, Rev. 2	Definitive	Soil/Aqueous, TAL Cyanide	Colorimeter	N
SW-846 8260C	Volatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), August 2006, Rev. 3	Definitive	Soil/Aqueous, TAL/TCLP Volatiles	GC/MS	N
SW-846 8270D	Semivolatile Organic Compounds by Gas Chromatography/Mass Spectrometry (GC/MS), July 2014, Rev. 5	Definitive	TAL Soil/Aqueous, TAL/TCLP SemiVolatiles	GC/MS	N
SW-846 8081B	Organochlorine Pesticides by Gas Chromatography, February 2007, Rev. 2	Definitive	Soil/Aqueous, TAL/TCLP Pesticides	GC	N
SW-846 8082A	Polychlorinated Biphenyls (PCBs) by Gas Chromatography, February 20017, Rev. 1	Definitive	Soil/Aqueous, TAL/TCLP PCBs	GC	N
SW-846 8151A	Chlorinated Herbicides by GC Using Methylation or Pentafluorobenzylation Derivatization, December 1996, Rev. 1	Definitive	Soil/Aqueous, TAL Pesticide/ TCLP Herbicides	GC	N
SW-846 1311	Toxicity Characteristic Leaching Procedure, July 1992, Rev. 0	Definitive	Soil/TCLP	ICP-AES	N
SW-846 9012A	Total and Amenable Cyanide (Automated Colorimetric With Off-Line Distillation), November 2004, Rev. 2	Definitive	Soil/RCRA	Colorimeter	N
SW-846 9034	Titremic Procedure for Acid-Soluble and Acid Insoluble Sulfides, December 1996, Rev. 0	Definitive	Soil/RCRA	Titrimeter	N
SW-846 1030	Ignitability of Solids, July 2014, Rev. 1	Definitive	Soil/RCRA	Burner with propane gas and air, thermometer, and anemometer	N
SW-846 9045C	pH Electrometric Measurement, November 2004, Rev. 3	Definitive	Soil/RCRA	Electrometer	N

ICP-AES = Inductively Coupled Plasma-Atomic Emission Spectrometer
CVAA = Cold Vapor Atomic Absorption
GC = Gas Chromatograph
GC/MS = Gas Chromatograph/Mass Spectrometer

QAPP Worksheet #24: Analytical Instrument Calibration Table

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Gamma Spectroscopy	Energy and efficiency calibrations	After initial installation, annually and following maintenance that would affect calibration	Gamma Spectroscopy Detector Resolution - within +0.4 Full Width at Half Maximum (FWHM) of the value during the initial calibration Energy – within +1 keV of the known energies Efficiency – 90-110% of the efficiency determined during the initial calibration	Correct problem, re-calibrate and re-analyze any affected samples	Assigned Laboratory Personnel	RTCA, New York Gamma Spectroscopy SOP
Gamma Spectrometer	Initial Calibration Verification (ICAL) for Energy, Efficiency, and FWHM peak resolution	Prior to initial use, following repair or loss of control and upon incorporation of new or changed instrument settings	Peak energy difference is within 0.1 keV of reference energy for all points. Peak FWHM < 2.5 keV at 1332 keV. Energy vs channel slope equation shall be linear and accurate to 0.5 keV	Correct problem, then repeat ICAL.	Lab Manager / Analyst	ST-RD-0102
Gamma Spectrometer	Initial Calibration Verification (ICV)	After ICAL for energy/efficiency and prior to analysis of samples.	Observed peaks of second source standard fall within ± 10% of initial calibration value relative to the true value.	Verify second source standard and repeat ICV to check for errors. If that fails, identify and correct problem and repeat ICV or ICAL and ICV as appropriate.	Lab Manager / Analyst	ST-RD-0102
Gamma Spectrometer	Continuing Calibration Verification (CCV) (Daily Check)	Daily or prior to use. When working with long count times or batch sequences that run more than a day, CCV is performed at the beginning and end of each analytical batch as long as it is not longer than a week.	Energy: ±0.5 keV at 60 keV; ± .75 keV at 1332 keV. FW HM: ±1.2x at 60 keV; ±1.8x at 662 keV; ±2.3x at 1332 keV. Activity Difference: %difference between the source activity and the reported activity ±5%	Correct problem, rerun CCV. If that fails, then repeat ICAL. Reanalyze all samples since the last successful calibration verification.	Lab Manager / Analyst	ST-RD-0102
Gamma Spectrometer	Background Subtraction Count Measurement (BSC) (Long count for subtracting background from blanks or test sources)	Immediately after ICAL and then performed on at least a monthly basis.	Background count rate of the entire spectrum with ±3σ of the average.	Recount and check control chart for trends. Determine cause, correct problem, re-establish BSC. If background activity has changed, re-establish BSC and reanalyze or qualify all impacted samples since last acceptable BSC.	Lab Manager / Analyst	ST-RD-0102

QAPP Worksheet #24: Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Gamma Spectrometer	Instrument Contamination Check (ICC) (Short count for controlling gross contamination)	Daily or when working with long count times before and after each analytical batch. Check after counting high activity samples.	No extraneous peaks identified (i.e., no new peaks in the short background spectrum compared to previous spectra); Background count rate of the entire spectrum with ±3σ of the average.	Recount the background. If still out of control, locate and correct problem; reanalyze or qualify all impacted samples since last acceptable ICC. If background activity has changed, re-establish BSC and reanalyze samples.	Lab Manager / Analyst	ST-RD-0102
Alpha Spectrometer	Initial Calibration (ICAL) (Energy, efficiency and FWHM peak resolution)	Prior to initial use, following repair or loss of control and upon incorporation of new or changed instrument settings.	3 isotopes within energy range of 3-6 MeV. Energy vs. channel slope equation <15 keV per channel. Full Width –Half Maximum (FWHM) <100 keV for each peak used for calibration. Minimum of 3,000 net counts in each peak.	Correct problem, then repeat ICAL.	Lab Manager / Analyst	ST-RD-0210
Alpha Spectrometer	Initial Calibration Verification (ICV)	After initial calibration.	FWHM ≤100 keV ; Each peak within ±40 keV of corresponding calibration peaks in initial energy calibration. Minimum 2000 net counts. Efficiency within 95% - 105% of initial calibration value.	Repeat ICV to check for error. If that fails, identify and correct problem and repeat ICV or ICAL and ICV, as appropriate.	Lab Manager / Analyst	ST-RD-0210
Alpha Spectrometer	Continuing Calibration Verification (CCV) (Pulser check)	Pulser verification daily, prior to analysis of samples.	Observed peak centroid falls ≤ 20 keV from reference energy.	Recount and check control chart for trends. Determine cause, correct problem, and repeat CCV and all associated samples since last successful CCV.	Lab Manager / Analyst	ST-RD-0210

QAPP Worksheet #24: Analytical Instrument Calibration Table (Continued)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
Alpha Spectrometer	Continuing Calibration Verification (CCV) (Check source)	Weekly source check verification prior to analysis of samples.	FWHM ≤100 keV; Each peak within ±40 keV of corresponding calibration peaks in initial energy calibration. Minimum 2000 net counts. Efficiency within 95% - 105% of initial calibration value.	Recount and check control chart for trends. Determine cause, correct problem, and repeat CCV and all associated samples since last successful CCV.	Lab Manager / Analyst	ST-RD-0210
Alpha Spectrometer	Background Subtraction Count (BSC) Measurement	Prior to initial use or after initial calibration and monthly.	Use a statistical test to determine a change in the background count rate value.	Check control chart for trends and recount. Determine cause, correct problem, re-establish BSC. If background activity has changed, re-establish BSC and reanalyze all impacted samples since last acceptable BSC.	Lab Manager / Analyst	ST-RD-0210
Alpha Spectrometer	Instrument Contamination Check (ICC)	Performed weekly, at minimum, and after counting high activity samples.	Within ±3σ of mean activity of recent BSC's (minimum of 3 BSCs)	Check control chart for trends and recount. Determine cause and correct problem. Background activity has changed, re-establish BSC and reanalyze all infected samples.	Lab Manager / Analyst	ST-RD-0210
Colorimeter	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory Colorimeter Technician	SW-846 Methods
Titrimeter	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory Titrimeter Technician	SW-846 Methods
Electrometer	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory Electrometer Technician	SW-846 Methods

QAPP Worksheet #24: Analytical Instrument Calibration Table (Concluded)

Instrument	Calibration Procedure	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	SOP Reference
ICP-AES	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory ICP-AES Technician	See SW-846 Methods
CVAA	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory CVAA Technician	SW-846 Methods
Colorimeter	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory Colorimeter Technician	SW-846 Methods
GC/MS	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory GC/MS Technician	SW-846 Methods
GC	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory GC Technician	SW-846 Methods

ICP-AES – Inductively Coupled Plasma-Atomic Emission Spectrometer
GC/MS – Gas Chromatograph/Mass Spectrometer
CVAA – Cold Vapor Atomic Absorption
GC – Gas Chromatograph

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person for CA	SOP Reference[1]
Gamma Spectroscopy	As per instrument manufacturer's recommendations	As per instrument manufacturer's recommendations; check connections	As per instrument manufacturer's recommendations	Acceptable re-calibration; see RTCA Gamma Spectroscopy SOP	Inspect the system, correct problem, re-calibrate and/or reanalyze samples.	RTCA Gamma Spectroscopy Technician	RTCA, New York Gamma Spectroscopy SOP
Gamma Spectrometer	1. Clean cave; fill dewar with N2	1. Physical check	1. Physical check	1. Weekly	1. Acceptable background	Recalibrate	TestAmerica Analyst
Gamma Spectrometer	2. QA check	2. Background and source check	2. Check deviation	2. Daily	2. Within 3 sigma of measured population	Instrument maintenance and consult with Technical director	TestAmerica Analyst
Alpha Spectrometer	1. Clean planchette holders	1. Physical check	1. Physical check	1. Monthly	1. Acceptable background and calibration efficiencies	Recalibrate	TestAmerica Analyst
Alpha Spectrometer	2. Pulser check and background checks	2. Background and source check	2. Check deviation	2. Daily	2. Pulser energy, centroid peak, resolution area peak, calibration and background must pass statistical boundary out-of-range test.	Instrument maintenance and consult with Technical director	TestAmerica Analyst

QAPP Worksheet #25: Analytical Instrument and Equipment Maintenance, Testing, and Inspection Table (Concluded)

Instrument/ Equipment	Maintenance Activity	Testing/Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	Responsible Person for CA	SOP Reference[1]
ICP-AES	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory ICP-AES Technician	See SW-846 Methods
CVAA	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory CVAA Technician	See SW-846 Methods
Colorimeter	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory Colorimeter Technician	See SW-846 Methods
GC/MS	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory GC/MS Technician	See SW-846 Methods
GC	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory GC Technician	See SW-846 Methods
ICP-AES	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory ICP-AES Technician	See SW-846 Methods
CVAA	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	See SW-846 Methods	Non-CLP Laboratory CVAA Technician	See SW-846 Methods

[1] Specify the appropriate letter or number form the Analytical SOP References table (Worksheet #23).ICP-AES – Inductively Coupled Plasma-Atomic Emission Spectrometer
ICP-AES – Inductively Coupled Plasma-Atomic Emission Spectrometer
CVAA – Cold Vapor Atomic Absorption
GC/MS – Gas Chromatograph/Mass Spectrometer
GC – Gas Chromatograph
GC/ECD – Gas Chromatograph/Electron Capture Detector

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal

Sampling Organization: Weston Solutions, Inc., START V.
Laboratories: Radiochemistry, TAL and TCLP Inorganic, Organic analyses, and RCRA Characteristics Analyses/Eurofins TestAmerica, 13715 Rider Trail North, Earth City, MO 63045
Method of sample delivery (shipper/carrier): FedEx
Number of days from reporting until sample disposal: 60 days

Activity	Organization and Title or Position of Person Responsible for the Activity	SOP Reference[1]
Sample Labeling	START V Site Project Manager, START V Sampling Team	EPA-540-R-014-013, October 2014
Chain-of-Custody Form Completion	START V Site Project Manager, START V Sampling Team	EPA-540-R-014-013, October 2014
Sample Packaging	START V Site Project Manager, START V Sampling Team	EPA-540-R-014-013, October 2014
Shipping Coordination	START V Site Project Manager, START V Sampling Team	EPA-540-R-014-013, October 2014
Sample Receipt, Inspection, & Log-in	Laboratory Sample Custodian	EPA-540-R-014-013, October 2014
Sample Custody and Storage	Laboratory Sample Custodian /Laboratory Analytical Personnel	EPA-540-R-014-013, October 2014
Sample Disposal	Field Personnel/Laboratory Sample Custodian /Laboratory Analytical Personnel	EPA-540-R-014-013, October 2014

Sample Identification Procedures: Each sample collected by START V will be designated by a code that will identify the sample in accordance with previous sampling (if applicable). An alpha-numeric code that identifies the site-specific property number will begin the sample nomenclature, followed by media type and location. Duplicate samples will be identified in the same manner as other samples and will be distinguished and documented in the field logbook.

Example sample naming for soil sample: HTCRV2-WC01-0612-01
HTCRV2- Site Identification Number; WC01- Waste Classification Location 01; 0612- Sample Depth at 6 to 12 inches bgs; 01- First Sample; Field Duplicate will be identified in the same manner, but will be the next sequential sample number (02)

QAPP Worksheet #26 & 27: Sample Handling, Custody, and Disposal (Concluded)

Field Sample Custody Procedures (sample collection, packaging, shipment, and delivery to laboratory): Each sample will be individually identified and labeled after collection, then sealed with custody seals and enclosed in a plastic cooler. The sample information will be COC forms, and the samples shipped to the appropriate laboratory via overnight delivery service or courier. Chain-of-custody records must be prepared in Scribe to accompany samples from the time of collection and throughout the shipping process. Each individual in possession of the samples must sign and date the sample COC Record. The chain-of-custody record will be considered completed upon receipt at the laboratory. A traffic report and chain-of-custody record will be maintained from the time the sample is taken to its final deposition. Every transfer of custody must be noted and signed for, and a copy of this record kept by each individual who has signed. When samples are not under direct control of the individual responsible for them, they must be stored in a locked container sealed with a custody seal. Specific information regarding custody of the samples projected to be collected on the weekend will be noted in the field logbook. The chain-of-custody record should include (at minimum) the following: 1) Sample identification number; 2) Sample information; 3) Sample location; 4) Sample date; 5) Sample Time; 6) Sample Type Matrix; 7) Sample Container Type; 8) Sample Analysis Requested; 9) Name(s) and signature(s) of sampler(s); and 10) Signature(s) of any individual(s) with custody of samples.

A separate chain-of-custody form must accompany each cooler for each daily shipment. The chain-of-custody form must address all samples in that cooler, but not address samples in any other cooler. This practice maintains the chain-of-custody for all samples in case of mis-shipment.

Laboratory Sample Custody Procedures (receipt of samples, archiving, and disposal): A sample custodian at the laboratory will accept custody of the shipped samples, and check them for discrepancies, proper preservation, integrity, etc. If noted, issues will be forwarded to the laboratory manager for corrective action. The sample custodian will relinquish custody to the appropriate department for analysis. At this time, no samples will be archived at the laboratory. Disposal of the samples will occur only after analyses and QA/QC checks are completed.

[1]Note: Refer to Contract Laboratory Program Guidance for Field Samplers, EPA-540-R-014-013, October 2014 at:
https://www.epa.gov/sites/production/files/2015-03/documents/samplers_guide.pdf

QAPP Worksheet #28: QC Samples Table
QAPP Worksheet #28A: Radiochemistry - Gamma Spectroscopy (non-CLP Worksheet)

Matrix	Soil/Rock/Slag
Analytical Group	Gamma Spec
Concentration Level	Low/Medium (pCi/g)
Sampling SOP(s)	EPA/ERT 2001, 2012, MARSSIM
Analytical Method/SOP Reference	EPA Method 901.1
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	10

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per preparation batch	No target analytes detected > target detection limit	Correct problem. If required, re-prepare and reanalyze MB and all samples processed with the contaminated blank.	Analyst, Supervisor	Accuracy/Bias/ Contamination	No target analytes detected > target detection limit
LCS	One per preparation batch	Recovery limits: 87-120% for Cs-137, 87-115% for Co-60, 87-116% for Am-241	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Supervisor	Accuracy/Bias	Target analytes must be within recovery limits
Duplicate	One per preparation batch	RPD limit of 40% or DER < 3	Correct problem, then re-prepare and reanalyze all samples in the associated preparatory batch, if not excursion not cuased by sample matrix.	Analyst, Supervisor	Precision/ Accuracy/Bias	The absolute value of the sample analyte result minus the duplicate analyte result divided by the square root of the sum of the squares of the sample and duplicate one-sigma analyte uncertainties must be less than 3.0

QAPP Worksheet #28: QC Samples Table (Continued)
QAPP Worksheet #28B: Radiochemistry - Alpha Spectroscopy (non-CLP Worksheet)

Matrix	Soil/Rock/Slag
Analytical Group	Alpha Spec
Concentration Level	Low/Medium (pCi/g)
Sampling SOP(s)	EPA/ERT 2001, 2012, MARSSIM
Analytical Method/SOP Reference	HASL-300/A-01-R
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	10

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective	Data Quality Indicator (DQI)	Measurement Performance Criteria
Method blank	One per preparation batch	No analytes detected > target detection limit	Correct problem. If required, re-prepare and reanalyze MB and all samples processed with the contaminated blank.	Analyst, Supervisor	Accuracy/Bias/ Contamination	No target analytes detected > target detection limit
LCS	One per preparation batch	Recovery limits: 84-120% for U-234 and 82-122% forU-238 Recovery limits: 81-118% for Th-230	Correct problem, then re-prepare and reanalyze the LCS and all samples in the associated preparatory batch for failed analytes, if sufficient sample material is available.	Analyst, Supervisor	Accuracy/Bias	Target analytes must be within recovery limits
Duplicate	One per preparation batch	RPD limit of 40% or DER < 3	Correct problem, then re-prepare and reanalyze all samples in the associated preparatory batch, if not excursion not cuased by sample matrix.	Analyst, Supervisor	Precision/ Accuracy/Bias	The absolute value of the sample analyte result minus the duplicate analyte result divided by the square root of the sum of the squares of the sample and duplicate one-sigma analyte uncertainties must be less than 3.0

QAPP Worksheet #28: QC Samples Table (Continued)
QAPP Worksheet #28B: Radiochemistry - Alpha Spectroscopy (non-CLP Worksheet) (Concluded)

Matrix	Soil/Rock/Slag
Analytical Group	Alpha Spec
Concentration Level	Low/Medium (pCi/g)
Sampling SOP(s)	EPA/ERT 2001, 2012, MARSSIM
Analytical Method/SOP Reference	HASL-300/A-01-R
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	10

QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective	Data Quality Indicator (DQI)	Measurement Performance Criteria
Tracer (U-232 and Th-229)	Every Sample	Recovery limits of 30-110%	Truncate tracers above 100% recovery to eliminate low biased results. Reprep and reanalyze sample if carrier is low (indicating high biased results) if there is activity in the sample above the reporting limit. No reanalysis if matrix interference is noticed during sample preparation.	Analyst, Supervisor	Accuracy/Bias	Tracer yield within recovery limits

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28C: TAL/TCLP Volatile - Soil (Non-CLP Worksheet)

Matrix	Soil/Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Volatile Organics
Concentration Level	Low/Medium/High (mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8260C
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 every 12 hours	No analyte > CRQL*		Suspend analysis unit source recertified	Subcontracted RAS Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
* Matrix Spike (Not Required)	1 per ≤ 20 samples; if requested	1,1-Dichloroethene	70-130 %R	Flag outliers, conjunction with other QC criteria.	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	1,1-Dichloroethene	70-130 %R
		Trichloroethene	70-130 %R				Trichloroethene	70-130 %R
		Benzene	70-130 %R				Benzene	70-130 %R
		Toluene	70-130 %R				Toluene	70-130 %R
* Matrix Spike Duplicate (Not Required)	1 per ≤ 20 samples; if requested	1,1-Dichloroethene	0-20 %RPD	Flag outliers, conjunction with other QC criteria.	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Precision	1,1-Dichloroethene	0-20 %RPD
		Trichloroethene	0-20 %RPD				Trichloroethene	0-20 %RPD
		Benzene	0-20 %RPD				Benzene	0-20 %RPD
		Toluene	0-20 %RPD				Toluene	0-20 %RPD
Surrogate Recovery	All Samples	4-Bromofluorobenzene	70-130 %R	Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet necessary limits (follow SOP: HW-24 for qualifications)	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	4-Bromofluorobenzene	70-130 %R
		Dibromofluoromethane	70-130 %R				Dibromofluoromethane	70-130 %R
		Toluene-d8	70-130 %R				Toluene-d8	70-130 %R
		Dichloroethane-d4	70-130 %R				Dichloroethane-d4	70-130 %R

* Laboratory spike entire list of compounds, but at the minimum, above compounds are require. For MS/MSD and LCS Laboratory can also use in house performance criteria

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28C: TAL/TCLP Volatile - Soil (Non-CLP Worksheet) (Concluded)

Matrix	Soil /Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Volatile Organics
Concentration Level	Low/Medium/High (mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8260C
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Internal Standards	all samples	50-100% of area, $\pm$ 30 sec retention time shift	Check calculations and instruments, reanalyze affected samples; up to 3 DMCs per sample may fail to meet necessary limits (Section 11.3.4, Page D45/VOC of SOM02.4)	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	50-100% of area, $\pm$ 30 sec retention time shift
LCS	1 per $\leq$ 20 samples; if requested	70-130 %R %RPD < 20	Flag outliers	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy Precision	70-130 %R %RPD < 20
Field Duplicate	1 per $\leq$ 20 samples; if requested	%RPD < 20	Check calculation, and Flag outliers	Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	% RPD < 20

* Laboratory spike entire list of compounds, but at the minimum, above compounds are require.
Laboratory may use in house performance criteria

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28D: TAL/TCLP Semivolatile - Soil (Non-CLP Worksheet)

Matrix	Soil /Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Semivolatile Organics
Concentration Level	Low/Medium/High (mg/kg or mg/l)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8270D
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 per ≤ 20 samples or whenever samples extracted	No analyte > CRQL*		Suspend analysis unit source recertified	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	No analyte > CRQL*	
Matrix Spike (Not Required)	1 per ≤ 20 samples; if requested	Phenol	In House MS/MSD Recovery Or (See SW 846 Method 8270D, Table 6)	No action is taken on MS/MSD data alone. Qualify data in conjunction with other QC criteria	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	Phenol	In House MS/MSD Recovery Or (See SW 846 Method 8270D, Table 6
		2-Chlorophenol					2-Chlorophenol	
		N-Nitroso-di-n-propylamine					N-Nitroso-di-n-propylamine	
		4-Chloro-3-methylphenol					4-Chloro-3-methylphenol	
		Acenaphthene					Acenaphthene	
		4-Nitrophenol					4-Nitrophenol	
		2,4-Dinitrotoluene					2,4-Dinitrotoluene	
		Pentachloro-phenol					Pentachloro-phenol	
		1,2,4-Trichlorobenzene					1,2,4-Trichlorobenzene	
		1,4-Dichlorobenzene					1,4-Dichlorobenzene	
		2-Chlorophenol					2-Chlorophenol	
		Pyrene					Pyrene	
Matrix Spike Duplicate (Not Required)	1 per ≤ 20 samples; if requested	Phenol		Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Precision	Phenol	0-35 %RPD
		2-Chlorophenol					2-Chlorophenol	0-50 %RPD
		N-Nitroso-di-n-propylamine					N-Nitroso-di-n-propylamine	0-38 %RPD

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28D: TAL/TCLP Semivolatile – Soil (Non-CLP Worksheet) (Concluded)

Matrix	Soil /Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Semivolatile Organics
Concentration Level	Low/Medium/High (mg/kg or mg/l)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8270D
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Matrix Spike Duplicate (Not Required) [cont'd]	1 per ≤ 20 samples; if requested	4-Chloro-3-methylphenol	In House MS/MSD Recovery Or (See SW 846 Method 8270D, Table 6)	No anion is taken on MS/MSD data alone. Qualify data in conjunction with other QC criteria	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Precision	4-Chloro-3-methylphenol	0-33 %RPD
		Acenaphthene					Acenaphthene	0-19 %RPD
		4-Nitrophenol					4-Nitrophenol	0-50 %RPD
		2,4-Dinitrotoluene					2,4-Dinitrotoluene	0-47 %RPD
		Pentachloro-phenol					Pentachloro-phenol	0-47 %RPD
		1,2,4-Trichlorobenzene						
		1,4-Dichlorobenzene						
		2-Chlorophenol						
		Pyrene					Pyrene	0-36 %RPD
Surrogate Compounds	all samples	Phenol-d5	Lab In House recovery limit or SW 846 Method 8270B-43; 8000C-24	Check calculations and instruments, reanalyze affected samples; (follow SOP: HW-22 for qualifications)	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	Phenol-d5	17-103 %R
		2-Fluorophenol					Bis(2-chloroethyl)ether-d8	12-98 %R
		2-Fluorobiphenyl					2-Chlorophenol-d4	13-101 %R
		2,4,6-Tribromophenol					4-Methylphenol-d8	8-100 %R
		Nitrobenzene-d5					Nitrobenzene-d5	16-103 %R
		Terphenyl-d14					2-Nitrophenol-d4	16-104 %R
Internal Standards	all samples	50-100% of area, ± 30 sec retention time shift	Check calculations and instruments, reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory GC/MS Technician	Accuracy	50-100% of area, ± 30 sec retention time shift	Internal Standards	all samples

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28E: TAL/TCLP Pesticide - Soil (Non-CLP Worksheet)

Matrix	Soil /Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Pesticides
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8081B
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 per ≤ 20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis unit source recertified	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy	No analyte > CRQL	
Matrix Spike	1 per ≤ 20 samples	gamma-BHC (Lindane)	46-127 %R	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy	gamma-BHC (Lindane)	46-127 %R
		Heptachlor	35-130 %R				Heptachlor	35-130 %R
		Aldrin	34-132 %R				Aldrin	34-132 %R
		Dieldrin	31-134 %R				Dieldrin	31-134 %R
		Endrin	42-139 %R				Endrin	42-139 %R
		4,4-DDT	23-134 %R				4,4-DDT	23-134 %R
Matrix Spike Duplicate	1 per ≤ 20 samples	gamma-BHC	0-50 %RPD	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Precision	gamma-BHC	0-50 %RPD
		Heptachlor	0-31 %RPD				Heptachlor	0-31 %RPD
		Aldrin	0-43 %RPD				Aldrin	0-43 %RPD
		Dieldrin	0-38 %RPD				Dieldrin	0-38 %RPD
		Endrin	0-45 %RPD				Endrin	0-45 %RPD
		4,4-DDT	0-50 %RPD				4,4-DDT	0-50 %RPD

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28E: TAL Pesticide – Soil (Non-CLP Worksheet) (Continued)

Matrix	Soil /Rock/Slag/Aqueous
Analytical Group	TAL Pesticides
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8081B
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Laboratory Control Sample	all samples	gamma-BHC	50-120 %R	Check calculations and instruments, reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy	gamma-BHC	50-120 %R
		Heptachlor epoxide	50-150 %R				Heptachlor epoxide	50-150 %R
		Dieldrin	30-130 %R				Dieldrin	30-130 %R
		4,4'-DDE	50-150 %R				4,4'-DDE	50-150 %R
		Endrin	50-120 %R				Endrin	50-120 %R
		Endosulfan sulfate	50-120 %R				Endosulfan sulfate	50-120 %R
		gamma-Chlordane	30-130 %R				gamma-Chlordane	30-130 %R
Surrogate	all samples		30–150 %R	Check calculations and instruments, reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy		30-150 %R

Laboratory may use in house performance criteria

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28E: TAL/TCLP Pesticide – Soil (Non-CLP Worksheet) (Continued)

Matrix	Soil /Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Pesticides
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8081B
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 per ≤ 20 samples OR whenever samples extracted	No analyte > CRQL		Suspend analysis unit source recertified	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy	No analyte > CRQL	
Matrix Spike	1 per ≤ 20 samples; if requested	gamma-BHC (Lindane)	56-123 %R	Flag outliers	EPA non-CLP RAS Laboratory GC/ECD Technician	Accuracy	gamma-BHC (Lindane)	56-123 %R
		Heptachlor	40-131 %R				Heptachlor	40-131 %R
		Aldrin	40-120 %R				Aldrin	40-120 %R
		Dieldrin	52-126 %R				Dieldrin	52-126 %R
		Endrin	56-121 %R				Endrin	56-121 %R
		4,4'-DDT	38-127 %R				4,4'-DDT	38-127 %R
Matrix Spike Duplicate	1 per ≤ 20 samples; if requested	gamma-BHC	0-15 %RPD	Flag outliers	EPA non-CLP RAS Laboratory GC/ECD Technician	Precision	gamma-BHC	0-15 %RPD
		Heptachlor	0-20 %RPD				Helptachlor	0-20 %RPD
		Aldrin	0-22 %RPD				Aldrin	0-22 %RPD
		Dieldrin	0-18 %RPD				Dieldrin	0-18 %RPD
		Endrin	0-21 %RPD				Endrin	0-21 %RPD
		4,4'-DDT	0-27 %RPD				4,4'-DDT	0-27 %RPD
Laboratory Control Sample	1 per ≤ 20 samples	gamma-BHC	50-120 %R	Check calculations and instruments, reanalyze affected samples	EPA non-CLP RAS Laboratory GC/ECD Technician	Accuracy	gamma-BHC	50-120 %R

Laboratory may use in house performance criteria

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28E: TAL/TCLP Pesticide – Soil (Non-CLP Worksheet) (Concluded)

Matrix	Soil /Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Pesticides
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8081B
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Laboratory Control Sample [cont'd]	1 per ≤ 20 samples	Heptachlor epoxide	50-150 %R	Check calculations and instruments, reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy	Helpachlor epoxide	50-150 %R
Laboratory Control Sample [cont'd]	1 per ≤ 20 samples	Dieldrin	30-130 %R	Check calculations and instruments, reanalyze affected samples	GC/ECD Technician	Accuracy	Dieldrin	30-130 %R
		4,4'-DDE	50-150 %R				4,4'-DDE	50-150 %R
		Endrin	50-120 %R				Endrin	50-120 %R
		Endosulfan sulfate	50-120 %R				Endosulfan sulfate	50-120 %R
		gamma-Chlordane	30-130 %R				gamma-Chlordane	30-130 %R
Surrogate	all samples		30-150 %R	Check calculations and instruments, reanalyze affected samples	GC/ECD Technician	Accuracy		30-150 %R

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28F: TAL PCBs – Soil (Non-CLP Worksheet)

Matrix	Soil/Rock/Slag/Aqueous
Analytical Group	TAL PCBs
Concentration Level	Low/Medium (mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8082A
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits		Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria	
Method Blank	1 per ≤ 20 samples or whenever samples extracted	No analyte > CRQL		Suspend analysis unit source recertified	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy	No analyte > CRQL	
Matrix Spike	1 per ≤ 20 samples	Aroclor-1016	29-135 %R	EPA non-CLP RAS Laboratory GC/ECD Technician	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy	Aroclor-1016	29-135 %R
		Aroclor-1260	29-135 %R				Aroclor-1260	29-135 %R
Matrix Spike Duplicate	1 per ≤ 20 samples	Aroclor-1016	0-15 %RPD	EPA non-CLP RAS Laboratory GCECD Technician	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Precision	Aroclor-1016	0-15 %RPD
		Aroclor-1260	0-20 %RPD				Aroclor-1260	0-20 %RPD
Laboratory Control Sample	all samples	Aroclor-1016	50-150 %R	EPA non-CLP RAS Laboratory GC/ECD Technician	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy	Aroclor-1016	50-150 %R
		Aroclor-1260	50-150 %R				Aroclor-1260	50-150 %R
Surrogate	all samples		30-150%R	EPA non-CLP RAS Laboratory GC/ECD Technician	Weston Subcontracted RAS/non-RAS Laboratory GC/ECD Technician	Accuracy		30-150%R

Laboratory may use in house performance criteria

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28G: TAL/TCLP Herbicides– Soil (Non-CLP Worksheet)

Matrix	Soil/Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Herbicides
Concentration Level	Medium (mg/kg or mg/l)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 8151A/1311
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Measurement Performance Criteria
Method Blank	1 per ≤ 20 samples OR whenever samples extracted	No analyte > CRQL	Suspend analysis unit source recertified	EPA CLP RAS Laboratory GC/ECD Technician	No analyte > CRQL
Matrix Spike	1 per ≤ 20 samples; if requested	70-130 %R	Flag outliers	EPA CLP RAS Laboratory GC/ECD Technician	70-130 %R
Matrix Spike Duplicate	1 per ≤ 20 samples; if requested	70-130 %R	Flag outliers	EPA CLP RAS Laboratory GC/ECD Technician	70-130 %R
Laboratory Control Sample	1 per ≤ 20 samples	70-130 %R	Check calculations and instruments, reanalyze affected samples	EPA CLP RAS Laboratory GC/ECD Technician	70-130 %R
Surrogate	all samples	70-130 %R		EPA CLP RAS Laboratory GC/ECD Technician	70-130 %R

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28H: TAL/TCLP Metals and Mercury – Soil (Non-CLP Worksheet)

Matrix	Soil/Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Metals
Concentration Level	Low/Medium (mg/kg or mg/l)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 6010C
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank	1 per ≤ 20 samples	No constituent > RL	Suspend analysis until source rectified; redigest and reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	No constituent > RL
Matrix Spike	1 per ≤ 20 samples	75-125%R*	Flag outliers		Accuracy	75-125%R*
Duplicate	1 per ≤ 20 samples	± 20% RPD**	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Precision	± 20% RPD**
Post-Digestion Spike	after any analyte (except Ag and Hg) fails spike %R	80-120%R	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	80-120%R
ICP Serial Dilution	1 per ≤ 20 samples	< 10% D**	Flag outliers		Accuracy	< 10% D**
Interference Check Sample [ICP Analysis Only]	beginning, end and periodically during run (2 times every 8 hours)	Within ± 2 times CRQL of true value or ± 20% of true value, whichever is greater	Check calculations and instruments, reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Sensitivity	Within ± 2 times CRQL of true value or ± 20% of true value, whichever is greater***

*except when the sample concentration is greater than 4 times the spike concentration, then disregard the recoveries; no data validation action taken
**Reference Principal outline in USEPA Region II SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP – (include absolute difference criteria)
ICP serial dilution required only when initial concentration is ≥ 50 X MDL
***except when the sample and/or duplicate concentration is less than 5 times the CRQL, then ± CRQL.
Laboratory may use in house performance criteria

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28H: TAL/TCLP Metals and Mercury – Soil (Non-CLP Worksheet) (Concluded)

Matrix	Soil/Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Metals
Concentration Level	Low/Medium (mg/kg or ug/L)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 6010C
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Laboratory Control Sample	1 per ≤ 20 samples	Control limits 80 - 120% R or established by EPA*	Suspend analysis until source rectified; redigest and reanalyze affected samples	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	Control limits 80 - 120% R or established by EPA*
Internal Standard (ICP-MS)	All Samples	60 – 125% RI	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	60 – 125% RI

* If the EPA LCS is unavailable, other EPA QC samples or other certified materials may be used. In such cases, control limits for the LCS must be documented and provided.
Laboratory may use in house performance criteria

QAPP Worksheet #28: QC Samples Table (Continued)
Worksheet # 28I: Mercury – Soil (Non-CLP Worksheet)

Matrix	Soil/Rock/Slag/Aqueous
Analytical Group	TAL/TCLP Mercury
Concentration Level	Low/Medium (ug/L or mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 7471
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)	1 per ≤ 20 samples	No analyte > CRQL	Suspend analysis; redigest and reanalyze	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	No analyte > CRQL
Duplicate Sample	1 per ≤ 20 samples	± 20% RPD*	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Precision	± 20% RPD
Field Duplicate Sample	1 per ≤ 20 samples	± 20% RPD*	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Precision	± 20% RPD
Spike Sample	1 per ≤ 20 samples	75 – 125 %R	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	75 – 125 %R

*Reference USEPA Region II SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)
Laboratory may use in house performance criteria.

QAPP Worksheet #28: QC Samples Table (Concluded)
Worksheet # 28J: Cyanide – Soil (Non-CLP Worksheet)

Matrix	Soil/Rock/Slag/Aqueous
Analytical Group	Cyanide
Concentration Level	Low/Medium (ug/L or mg/kg)
Sampling SOP(s)	EPA ERT/SERAS contractor SOP Nos. 2001 and 2012
Analytical Method/SOP Reference	SW-846 9012B
Sampler's Name	Sean Quinn
Field Sampling Organization	Weston Solutions, Inc.
Analytical Organization	TestAmerica
No. of Sample Locations	2

Lab QC Sample:	Frequency/Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Preparation Blank (PB)	1 per ≤ 20 samples	No analyte > CRQL	Suspend analysis; redistill and reanalyze	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	No analyte > CRQL
Duplicate Sample	1 per ≤ 20 samples	± 20% RPD*	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Precision	± 20% RPD
Spike Sample	1 per ≤ 20 samples	75 – 125 %R	Flag outliers	Weston Subcontracted RAS/non-RAS Laboratory ICP-AES/ICP-MS Technician	Accuracy	75 – 125 %R

*Reference USEPA Region II SOP No. HW-2, Revision 13/Evaluation of Metals Data for CLP - (include absolute difference criteria)
Laboratory may use in house performance criteria

QAPP Worksheet #29: Project Documents and Records

Sample Collection and Field Records			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Field Logbook or Data Collection Sheets	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Chain-of-Custody Forms	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Custody Seals	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Air Bills	SPM/Field Personnel	Group Leader or Operations Manager	Project File
Daily QC Reports	SPM	Group Leader or Operations Manager	Project File
Deviations	SPM/Field Scientist	Group Leader or Operations Manager	Project File
Corrective Action Reports	Delegated QA Manager	Operations Manager or Program Manager or designee	Project File
Correspondence	SPM	Delegated QA Manager	Project File
Field Sample Results/Measurements	SPM/Field Scientist	Delegated QA Manager	Project File
Tailgate Safety Meeting Items	SPM/Field Safety Officer	Delegated QA Manager	Project File

Project Assessments			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Data Verification Checklists	Data validator/Chemist QA/QC Specialist	Group Leader or Operations Manager	Project File
Data Validation Report	Data validator/Chemist QA/QC Specialist	Group Leader or Operations Manager	Project File
Data Usability Assessment Report	Site Project Manager	Group Leader or Operations Manager	Project File
Corrective Action Reports	Group Leader/HSO/Chemist QA/QC Specialist	Group Leader	Project File
Correspondence	Group Leader/HSO/Chemist QA/QC Specialist	Program Manager or designee	Project File

QAPP Worksheet #29: Project Documents and Records (Concluded)

Laboratory Records			
Record	**Generation**	**Verification**	**Storage Location/Archival**
Sample Receipt, Custody, and Checklist	Laboratory Sample Receiving	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Equipment Calibration Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Standard Traceability Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Sample Prep Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Run Logs	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Equipment Maintenance, Testing, and Inspection Logs	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory File
Corrective Action Reports	Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory File and Project File
Laboratory Analytical Results	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Laboratory QC Samples, Standards, and Checks	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Instrument Results (raw data) for Primary Samples, Standards, QC Checks, and QC Samples	Laboratory Technician/ Laboratory QA Manager	Laboratory PM/Delegated QA Manager	Laboratory Data Package and Project File
Sample Disposal Records	Laboratory Technician	Laboratory PM/Delegated QA Manager	Laboratory File

Laboratory Data Deliverables[1]						
Record	**TAL/TCLP VOCs**	**TAL/TCLP SVOCs**	**TAL PCBs**	**TAL/TCLP Pesticides**	**TAL/TCLP Metals**	**Other[2]**
Narrative	Y	Y	Y	Y	Y	Y
Chain of Custody	Y	Y	Y	Y	Y	Y
Summary Results	Y	Y	Y	Y	Y	Y
QC Results	Y	Y	Y	Y	Y	Y
Chromatograms or raw data	Y	Y	Y	Y	Y	Y
Tentatively Identified Compounds	Y	Y	NA	NA	NA	NA

[1] The blank Laboratory Data Deliverables table is designed to be a checklist for use in supporting data completeness. The records and analytical groups in this table are not all inclusive of those that may be used on a specific project and should be modified and utilized by the delegated SPM as applicable
[2] Isotopic Thorium/Alpha Spectroscopy, Isotopic Uranium/Alpha Spectroscopy, Gamma Spectroscopy, Full TCLP, Herbicides, RCRA Characteristics

Worksheet 31, 32 & 33: Assessments and Corrective Action

Assessments:

Assessment Type	Responsible Party & Organization	Number/ Frequency	Estimated Dates	Assessment Deliverable	Deliverable Due Date
Field Sampling Technical Systems Audit (TSA)[1]	Chemist QA/QC Specialist (or designee) and Group Leader or Operations Manager WESTON	As needed, as determined by WESTON Chemist QA/QC Specialist (or designee) and Group Leader or Program Manager WESTON	To be completed near the beginning of field sample collection activities/TBD	TSA Memorandum and Checklist	48 to 72 hours following assessment
Laboratory TSA[2]	Laboratory QA Managers Regulatory Agency	Certified subcontract laboratories are routinely audited by accrediting authorities.	Every Year	Written Report	14 Days
Data Validation	Chemist QA/QC Specialist or Data Validator/CHP, WESTON	Each data package for which data validation was requested; varies by site	Within 42 days from sampling date	Data Validation Report	Varies by site
Management Review	Group Leader and/or Operations Manager, WESTON	Varies; as determined by WESTON Program Manager	Within 42 days from sampling date	Quality Management Report (memo/e-mail to file)	1-2 weeks following assessment

[1] Field sampling TSAs may include, but are not limited to the following: sample collection records; sample handling, preservation, packaging, shipping, and custody records; equipment operation, maintenance, and calibration records.

[2] Laboratory TSAs may include, but are not limited to the following: sample log-in, identification, storage, tracking, and custody procedures; sample and standards preparation procedures; availability of analytical instruments; analytical instrument operation, maintenance, and calibration records; laboratory security procedures; qualifications of analysts; case file organization and data handling procedures.

Worksheet 31, 32 & 33: Assessments and Corrective Action (Concluded)

Assessment Response and Corrective Action:

Assessment Type	Responsibility for Responding to Assessment Findings	Assessment Response Documentation	Timeframe for Response	Responsibility for Implementing Corrective Action	Responsible for Monitoring Corrective Action Implementation
Field Sampling Technical Systems Audit (TSA)[1]	SPM, WESTON	Findings of field audit.	24 hours of receipt of audit report	Operations Manager, WESTON	SPM or Operations Manager, WESTON
Laboratory TSA[2]	Non-CLP Laboratory: TestAmerica QA manager: Mike Franks Chemist QA/QC Specialist (or designee) WESTON	Written response to EPA Region II to address deficiencies	1 week of receipt of request from EPA Region II (or START V on behalf of EPA)	Laboratory Manager	Quality Manager (or designee) and/or Chemist, WESTON
Data Validation	Chemist QA/QC Specialist (or designee) WESTON	Validation Report	Within 48 hours of receipt of validation inquiry	Laboratory QA Manager and/or Chemist	Chemist, WESTON
Management Review	Program Manager WESTON	Quality Management Response	48 hours of receipt of Quality Management report	Program Manager, WESTON	Chemist QA/QC Specialist (or designee) and Program Manager, WESTON

[1] Field sampling TSAs may include, but are not limited to the following: sample collection records; sample handling, preservation, packaging, shipping, and custody records; equipment operation, maintenance, and calibration records.

[2] Laboratory TSAs may include, but are not limited to the following: sample log-in, identification, storage, tracking, and custody procedures; sample and standards preparation procedures; availability of analytical instruments; analytical instrument operation, maintenance, and calibration records; laboratory security procedures; qualifications of analysts; case file organization and data handling procedures.

QAPP Worksheet #34: Data Verification and Validation Inputs

Item	Description	Verification (completeness)	Validation (conformance to specifications)
Planning Documents/Records			
1	Approved QAPP	X	
2	Contract	X	
3	Field SOPs	X	
4	Laboratory SOPs	X	
5	Laboratory QA Manual	NA	
6	Laboratory Certifications	X	
Field Records			
7	Field Logbooks	X	X
8	Equipment Calibration Records	X	X
9	Chain of Custody Forms	X	X
10	Sampling Diagrams/Surveys	X	X
11	Drilling Logs	NA	NA
12	Geophysics Reports	NA	NA
13	Relevant Correspondence	X	X
14	Change Orders/Deviations	X	X
15	Field Audit Reports	X	X
16	Field Corrective Action Reports	X	X
17	Sample Location Verification (Worksheet 18)	X	X
Analytical Data Package and Other Laboratory Deliverables			
18	Cover Sheet (laboratory identifying information)	X	X
19	Case Narrative	X	X
20	Internal Laboratory Chain of Custody	X	X
21	Sample Receipt Records	X	X
22	Sample Chronology (i.e. dates and times of receipt, preparation, & analysis)	X	X
23	Communication Records	X	X
24	Project-specific PT Sample Results	NA	NA
25	RL/MDL Establishment and Verification	X	X
26	Standards Traceability	NA	NA
27	Instrument Calibration Records	X	X
28	Definition of Laboratory Qualifiers	X	X
29	Results Reporting Forms	X	X
30	QC Sample Results	X	X
31	Corrective Action Reports	X	X
32	Raw Data	X	X
33	Electronic Data Deliverable	X	X

QAPP Worksheet #35: Data Verification Procedures

Records Reviewed	Required Documents	Process Description	Responsible Person, Organization
Contract QAPP	Contract, EPA and UFP-QAPP Guidance documents	Verify completeness, correctness, and contractual compliance of all program QA/QC against the methods, SOPs, and contract requirements.	Timothy Benton WESTON Program Manager Smita Sumbaly, WESTON Chemist QA/QC Specialist
Site-specific QAPP	Contract QAPP, Work Scope in TDD	Verify sampling and analytical methods specified in site-specific QAPP are correct and all contract QAPP protocols are followed and required QC samples will be collected in the correct bottles and properly preserved.	Bernard Nwosu WESTON Operations Manager Smita Sumbaly, WESTON Chemist QA/QC Specialist
Field Logs and SOPs	Contract and site-specific QAPP, SOPs	Ensure that all field sampling SOPs specified in site-specific QAPP were followed.	WESTON SPM and Data Validation Personnel
Analytical SOPs	Analytical Method and Contract QAPP	Ensure that laboratory analytical SOPs comply with the published method.	Mike Franks/TestAmerica, non-CLP Laboratories QA Managers. Smita Sumbaly, WESTON Chemist QA/QC Specialist /Data validation Personnel
Laboratory QA Manual	EPA Guidance Documents	Verify that best practices specified in EPA Guidance Documents are incorporated into the Laboratory QA Manual.	Mike Franks/TestAmerica, non-CLP Laboratories QA Managers. Smita Sumbaly, WESTON Chemist QA/QC Specialist /Data validation Personnel
Laboratory Certifications	Generic and site-specific QAPP	Ensure that laboratory performing analytical sample analyses has current State, National Environmental Laboratory Accreditation Program, National Voluntary Laboratory Accreditation Program, or American Industrial Hygiene Association certifications as required by the project.	Mike Franks/TestAmerica, non-CLP Laboratories QA Managers. Smita Sumbaly, WESTON Chemist QA/QC Specialist /Data validation Personnel
Laboratory Deliverables	Contract and site-specific QAPP	Verify that the laboratory deliverable contains all records specified in the contract QAPP. Check sample receipt records to ensure sample condition upon receipt was noted, and any missing/broken sample containers were noted and reported. Compare the data package with Chains of custody to verify that results were provided for all collected samples. Review the narrative to ensure all QC exceptions are described. If Stage 2B or higher validation is required, verify that analytical instrumentation met calibration requirements. Check for evidence that any required notifications were provided to project personnel. Verify that necessary signatures and dates are present.	Laboratory QA Managers: TestAmerica/Mike Franks Non-CLP Data: Data Validators, WESTON, Smita Sumbaly, Chemist QA/QC Specialist

* Site-specific QAPP may contain additional data validation inputs as required by the project objectives.

QAPP Worksheet #35: Data Verification Procedures (Concluded)

Records Reviewed	Required Documents	Process Description	Responsible Person, Organization
WESTON Data Validation Deliverables	Laboratory Report, Analytical Method and Laboratory SOPs	Verify that the report consists of the following for all field samples submitted to the laboratory: 1) Data validation report (pdf), 2) Sample Summary Report with data validation qualifiers, and 3) Excel EDD file with data validation qualifiers	WESTON Data Validator Smita Sumbaly, WESTON Chemist QA/QC Specialist
Field Logbook, Field Sheets, Sample Diagrams/ Surveys	Contract and site-specific QAPP	Verify that records are present and complete for each day of field activities. Verify that all planned samples including field QC samples were collected and that sample collection locations are documented. Verify that meteorological data were provided for each day of field activities. Verify that changes/exceptions are documented and were reported in accordance with requirements. Verify that any required field monitoring was performed and results are documented.	WESTON SPM and Operations Manager
Field Equipment Calibration Records	Contract and site-specific QAPP, SOPs, field logbook	Ensure that all field analytical instrumentation SOPs for equipment calibration were followed.	WESTON SPM and Operations Manager
Chain of Custody Forms	Site-specific QAPP; Field Logbook; and other sampling records (e.g., boring logs, etc.)	Verify the completeness of Chain-of-Custody records. Examine entries for consistency with the field logbook. Check that appropriate methods were requested and sample preservation was recorded. Verify that the required volume of sample has been collected and that sufficient sample volume is available for Laboratory QC samples (e.g., MS/MSD and S/D). Verify that all required signatures and dates are present. Check for transcription errors.	WESTON SPM, WESTON Chemist QA/QC Specialist, and Laboratory PMs: TestAmerica
Relevant reports and correspondence	Contract and site-specific QAPP	Verify that reports are present and complete for each day of field activities. Verify that correspondence is documented and was reported in accordance with requirements.	WESTON Operations Manager and SPM
Audit Reports, Corrective Action Reports	Generic and site-specific QAPP	Verify that all planned audits were conducted. Examine audit reports. For any deficiencies noted, verify that corrective action was implemented according to plan.	Smita Sumbaly, WESTON Chemist QA/QC Specialist Laboratory PMs: TestAmerica

Worksheet 36 — Data Validation Procedures

The following information is project-specific and will be identified in the site-specific or QAPP.

Data Validator: WESTON

Analytical Group/ Method	Data Deliverable Requirements	Analytical Specifications	MPC	Percent of Data Packages to be Validated	Percent of Raw Data Reviewed	Percent of Results to be Recalculated	Validation Procedure	Validation Code	Electronic Validation Program/Version
Radiochemistry – EPA 901.1/HASL-300-A-01-R	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	As per lab SOPs and Analytical Methods	Validated Manually (VM)	Excel EDD
TAL/TCLP VOC-SW-846 8260C	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	Region 2 SOP No. HW-24, Revision 4, October 2014	Validated Manually (VM)	Excel EDD
TAL/TCLP SVOC-SW-846 8270D	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	Region 2 SOP No. HW-22, Revision 5, December 2010	Validated Manually (VM)	Excel EDD
TAL/TCLP Pesticides SW-846 8081B	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	Region 2 SOP No. HW-44, Revision 1.1, December 2010	Validated Manually (VM)	Excel EDD
TAL PCBs-SW-846 8081B	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	Region 2 SOP No. HW-37A, Revision 0, June 2015	Validated Manually (VM)	Excel EDD
TAL Metals + Hg + CN/ TCLP Metals + Hg – / SW-846 6010D/7471B/901C	SEDD Stage IIa/IIb	SEDD Stage IIa/IIb	Worksheets 12, 24, 28	100%	100%	10%	EPA Region 2 SOP No. HW-3a/3c, Revision 1, September 2016	Validated Manually (VM)	Excel EDD
Herbicides and TCLP Herbicides SW-846 8151A	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	Region 2 SOP No. HW-17, Revision 3.11, December 2010	Validated Manually (VM)	Excel EDD
RCRA Characteristics SW-846 9012B, 9034, 1030, 9045D	SEDD Stage IIa	SEDD Stage IIa	Worksheets 12, 24, 28	100%	100%	10%	AS per Analytical Methods and Lab QC criteria.	Validated Manually (VM)	Excel EDD

QAPP Worksheet #37: Usability Assessment

Data usability assessments (DUA) will be performed as directed by EPA. This worksheet documents procedures that will be used to perform the DUA. The DUA is performed at the conclusion of data collection activities using the outputs from data verification and data validation (i.e., data of known and documented quality). It is the data interpretation phase, which involves a qualitative and quantitative evaluation of environmental data to determine whether the Site data are of the right type, quality, and quantity to support the decisions that need to be made. It involves a retrospective evaluation of the systematic planning process, and involves participation by key members of the project team. The DUA evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence.

Data, whether generated in the field or by the laboratory, are tabulated and reviewed for PARCCS by the SPM for field data or the data validator for laboratory data. The review of the PARCC Data Quality Indicators (DQI) will compare with the Data Quality Objectives (DQO) detailed in the site-specific QAPP, the analytical methods used and impact of any qualitative and quantitative trends will be examined to determine if bias exists. A hard copy of field data is maintained in a designated field or site logbook. Laboratory data packages are validated, and final data reports are generated. All documents and logbooks are assigned unique and specific control numbers to allow tracking and management.

Where applicable, the following documents will be followed to evaluate data for fitness in decision making: EPA QA/G-4, Guidance on Systematic Planning using the Data Quality Objectives Process, EPA/240/B-06/001, February 2006, and EPA QA/G-9R, Guidance for Data Quality Assessment, A reviewer's Guide EPA/240/B-06/002, February 2006.

Personnel (organization and position/title) responsible for participating in the data usability assessment may include, but not be limited to:

- START V Operations Manager;
- START V Quality Manager (or designee);
- START V Risk Assessor;
- START V SPM;
- START V Chemist QA/QC Specialist;
- START V Statistician.

Based on project-specific oversight responsibilities and analytical scopes, this DUA worksheet outlines the approach that will be taken as the analytical scope expands on a project-specific basis.

The following general steps will be followed to assure that the data usability assessment evaluates whether underlying assumptions used during systematic planning are supported, sources of uncertainty have been accounted for and are acceptable, data are representative of the population of interest, and the results can be used as intended, with the acceptable level of confidence:

QAPP Worksheet #37: Usability Assessment (Concluded)

Step 1 – Review the project's objectives and sampling design: This includes reviewing the DQOs and MPC to make sure they are still applicable. The sampling design will be consistent with stated DQOs.

Step 2 – Review the data verification and data validation outputs: Graphs, maps, and tables can be prepared to summarize the data. Deviations from activities planned in the Project QAPP should be considered, including samples not collected (potential data gaps), holding time exceedances, damaged samples, impact of non-compliant PE sample results, and SOP deviations. The implications of unacceptable QC sample results will be assessed.

Step 3 – Verify the assumptions of the selected statistical method: The underlying assumptions for the selected statistical methods (if specified in the QAPP) will be verified for validity. Common assumptions include the distributional form of the data, independence of the data, dispersion characteristics, homogeneity, etc. Depending on the robustness of the statistical method, minor deviations from assumptions usually are not critical to statistical analysis and data interpretation. If serious deviations from assumptions are discovered, then another statistical method may be selected.

Step 4 - Implement the statistical method: If specified in the site-specific QAPP, statistical procedures will be implemented for analyzing the data and reviewing underlying assumptions. For a decision project that involves hypothesis testing (e.g., "concentrations of lead in groundwater are below the action level") the consequences of selecting the incorrect alternative will be considered; for estimation projects (e.g., establishing a boundary for surface soil contamination), the tolerance for uncertainty in measurements will be considered.

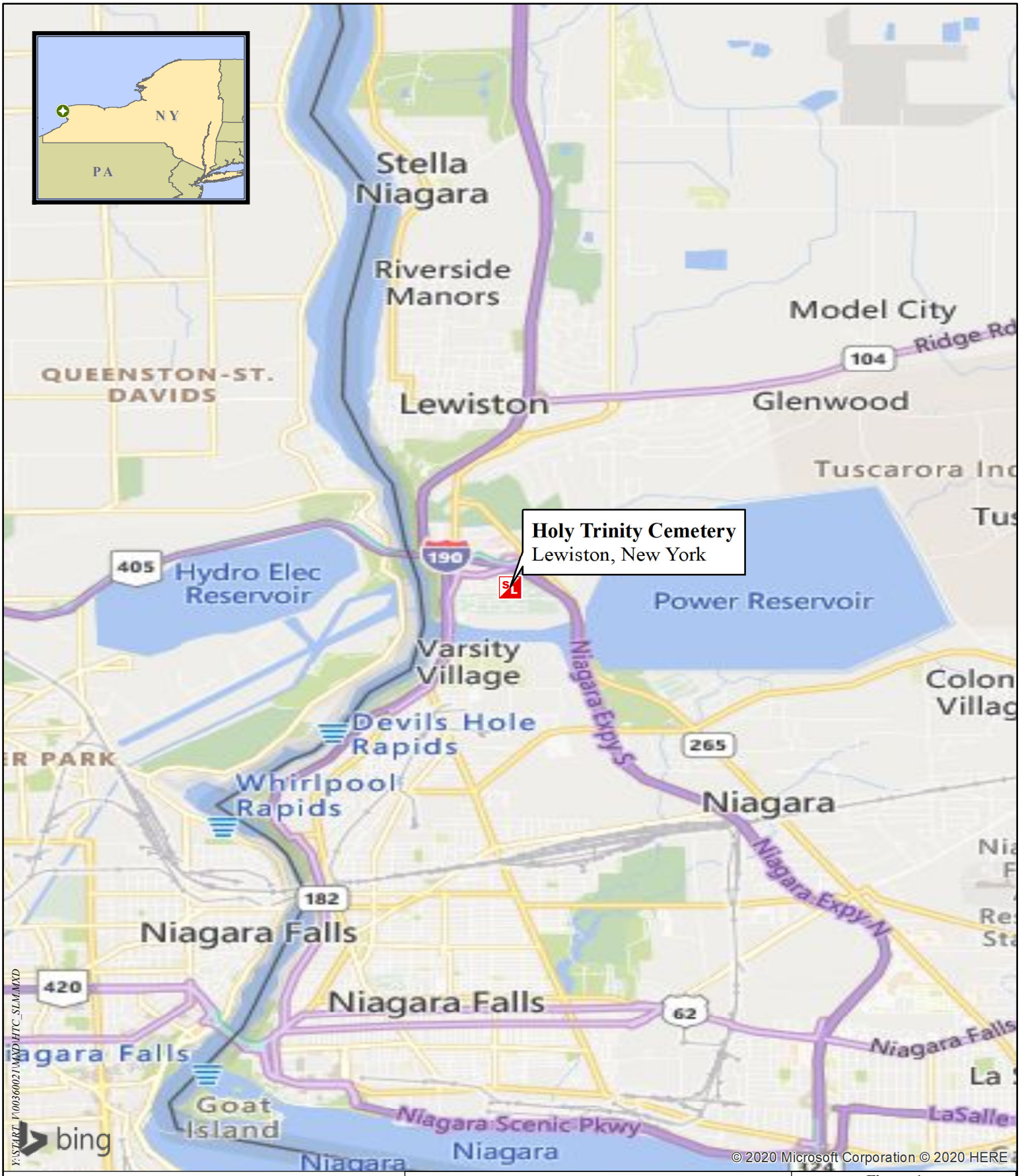
Step 5 – Document data usability and draw conclusions:

The DUA considered the final step in the data evaluation process. All data will be assessed for usability regardless of data evaluation/validation process implementation. Data usability goes beyond validation in that it evaluates the achievement of the DQOs based on the comparison of the project DQIs and site-specific QAPP with the obtained results. The results of the DUA, and particularly any changes to the DQOs necessitated by the data not meeting usability criteria, will be communicated in accordance with Worksheet 6.

The usability of the data as intended will be determined. Achievable DQOs, based on comparison with the Site DQIs, will be discussed. The performance of the sampling design will be assessed and limitations of the data use identified. The conceptual site model will be updated and conclusions documented. A DUA report (in the form of text/or table) will be prepared or a data usability summary will be included in the final report.

ATTACHMENT A

Figure 1: Site Location Map



Y:\START_V\003602\1\MXD\HTC_SLA.MXD

Legend

Site Location

N

0 0.4 0.8 1.6 2.4 3.2 Miles

Weston Solutions, Inc.
Federal East Division

In Association With
Eco-Risk; Avatar Environmental, LLC;
Pro-West & Associates, Inc.;
On-Site Environmental, Inc.;
and Sovereign Consulting, Inc.

Figure 1:
Site Location Map

Holy Trinity Cemetery
Lewiston, New York

U.S. ENVIRONMENTAL PROTECTION AGENCY
SUPERFUND TECHNICAL ASSESSMENT & RESPONSE TEAM V
CONTRACT # 68HE0319D0004

GIS ANALYST:	M. LANG
EPA OSC:	P. LISICHENKO
START V SPM:	B. NWOSU
CHARGE #::	40200.021.036.2021

DATE MODIFIED: 10/19/2020

ATTACHMENT B

Sampling SOPs

EPA ERT/SERAS SOP # 2001
EPA ERT/SERAS SOP # 2006
EPA ERT/SERAS SOP # 2012
MARSSIM Website

GENERAL FIELD SAMPLING GUIDELINES

CONTENTS

Complete Rewrite: SOP #2001; Revision 1.0; 03/15/13; U.S. EPA Contract EP-W-09-031

SUPERCEDES: SOP #2001; Revision 0.0; 08/11/94; U.S. EPA Contract 68-C4-0022

GENERAL FIELD SAMPLING GUIDELINES

1.0 OBJECTIVE

The objective of this standard operating procedure (SOP) is to describe the general field sampling techniques and guidelines that will assist the Scientific Engineering Response and Analytical Services (SERAS) personnel in planning, choosing sampling strategies and sampling locations, and frequency of Quality Control (QC) samples for proper assessment of site characteristics. The ultimate goal is to ensure data quality during field collection activities.

2.0 APPLICABILITY

This SOP applies to the collection of aqueous and non-aqueous samples for subsequent laboratory analysis to determine the presence, type, and extent of contamination at a site.

3.0 DESCRIPTION

Representative sampling ensures that a sample or a group of samples accurately reflect the concentration of the contaminant at a given time and location. Depending on the contaminant of concern and matrix, several variables may affect the representativeness of the samples and subsequent measurements. Environmental variability due to non-uniform distribution of the pollutant due to topographic, meteorological and hydrogeological factors, changes in species, and dispersion of contaminants and flow rates contribute to uncertainties in sampling design.

Determining the sampling approach depends on what is known about the site from prior sampling (if any) and the site history, variation of the contaminant concentrations throughout a site, potential migration pathways, and human and environmental receptors. The objectives of an investigation determine the appropriate sampling design.

The frequency of sampling and the specific sample locations that are required must be defined in the site-specific Quality Assurance Project Plan (QAPP).

3.1 Planning Stage

The objectives of an investigation are established and documented in the site-specific QAPP. The technical approach including the media/matrix to be sampled, sampling equipment to be used, sampling design and rationale, and SOPs or descriptions of the procedure to be implemented are included in the QAPP. Refer to the matrix-specific SOPs for sampling techniques which include the equipment required for sampling.

During the planning stage, the data quality objectives (DQOs) will be determined. In turn, the project's DQOs will determine the need for screening data or definitive data. Screening data supports an intermediate or preliminary decision but eventually is supported by definitive data before the project is complete (i.e., placement of monitor wells, estimation of extent of contamination). Definitive data is suitable for final decision making, has defined precision and accuracy requirements and is legally defensible (i.e., risk assessments, site closures).

3.2. Sampling Design

Representative sampling approaches include judgmental, random, systematic grid, systematic simple random, stratified random and transect sampling. Sampling designs may be applied to soil,

sediment and water; however, the random and systematic random approaches are not practical for sampling water systems, especially flowing water systems.

3.2.1 Judgmental Sampling

Judgmental sampling is the subjective selection of sampling locations based on the professional judgment of the field team. This method is useful to locate and to identify potential sources of contamination. It may not be representative of the full site and is used to document worst case scenarios. For example, groundwater sampling points are typically chosen based on professional judgment, whether permanently installed wells or temporary well points.

3.2.2 Systematic Sampling

Systematic grid sampling involves the collection of samples at fixed intervals when the contamination is assumed to be randomly distributed. A random point is chosen as the origin for the placement of the grid. A grid is constructed over a site and samples are collected from the nodes (where the grid lines intersect). Depending on the number of samples that are required to be collected, the distance between the sampling locations can be adjusted. The representativeness of the sampling may be improved by shortening the distance between sample locations.

Systematic random sampling is used for estimating contaminant concentrations within grid cells. Instead of sampling at each node, a random location is chosen within each grid cell. The systematic grid and random sampling approaches are useful for delineating the extent of contamination, documenting the attainment of clean-up goals, and evaluating and determining treatment and disposal options.

Transect sampling involves one or more transect lines established across the site. Samples are collected at systematic intervals along the transect lines. The number of samples to be collected and the length of the transect line determines the spacing between the sampling points. This type of sampling design is useful for delineating the extent of contamination at a particular site, for documenting the attainment of clean-up goals, and for evaluating and determining treatment and disposal options.

3.2.3 Simple and Stratified Random Sampling

Statistical random sampling includes simple, stratified and systematic sampling. Simple random sampling is appropriate for estimating means and total concentrations, if the site or population does not contain a major trend or pattern of contamination. A statistician will generate the sampling locations based on sound statistical methods. Stratified random sampling is a useful tool for estimating average contaminant concentrations and total amounts of contaminants within specified strata and across the entire site. It is useful when a heterogeneous population or area can be broken down into regions with less variability within the boundaries of a stratum then between the strata. Additionally, strata can be defined based on the decisions that will be made. This type of sampling design uses historical information, known ecological and human receptors, soil type, fate and transport mechanism and other ecological factors to divide the sampling area into smaller regions or strata. Sampling locations are selected from each stratum using random sampling.

The simple random sampling approach is applied when there are many sample locations and the concentrations are assumed to be homogeneous across a site with respect to the parameter(s) that are going to be analyzed or monitored for. The stratified random sampling approach is useful for sampling drums, evaluating and determining treatment and disposal options, and locating and identifying sources of contamination.

3.3 Sampling Techniques

Sampling is the selection of a representative portion of a larger population or body. The primary objective of all sampling activities is to characterize a site accurately in a way that the impact on human health and the environment can be evaluated appropriately.

3.3.1 Sample Collection Techniques

Sample collection techniques may be either grab or composite. A grab sample is a discrete aliquot representative of a specific location at a given time and collected all at once from one location. The representativeness of such samples is defined by the nature of the materials that are sampled. Samples collected for volatile organic compounds (VOCs) are always grab samples and are never homogenized. Composite samples are non-discrete samples composed of more than one specific aliquot collected at selected sampling locations. Composite samples must be homogenized by mixing prior to putting the sample into containers. Composite samples can, in certain instances, be used as an alternative to analyzing a number of individual grab samples and calculating an average value. Incremental sampling conducted over a grid is a special case of composite sampling and is detailed in SOP #2019, *Incremental Soil Sampling.* Choice of collecting discrete or composite samples is based on project's DQOs.

3.3.2 Homogenization

Mixing of soil and sediment samples is critical to obtain a representative sample. An adequate volume/weight of sample is collected and placed in a stainless steel or Teflon® container, and is thoroughly mixed using a spatula or spoon made of an inert material. Once the sample is thoroughly mixed the sample is placed into sample containers specific for an analysis. Avoid the use of equipment made of plastic or polyvinyl chloride (PVC) when sampling for organic compounds when the reporting limit (RL) is in the parts per billion (ppb) or parts per trillion (ppt) ranges. Refer to SERAS SOP #2012, *Soil Sampling*, for more details on homogenization.

3.3.3 Filtration

In-line filters are used specifically for collecting groundwater samples for dissolved metals analysis and for filtering large volumes of turbid groundwater. Groundwater samples collected for VOCs are typically not filtered due to potential VOC losses. Filtering groundwater is performed to remove silt particulates from samples to prevent interference with the laboratory analysis. The filters used in groundwater sampling are either cartridge type filters inserted into a reusable housing, or are self-contained and disposable. Filter chambers are usually made of polypropylene housing an inert filtering material that removes particles larger than 0.45 micrometers (µm). Refer to SERAS SOP

#2007, *Groundwater Well Sampling* and SERAS SOP #2013, *Surface Water Sampling*, for more details on filtration techniques.

3.4 Quality Assurance /Quality Control Samples

QA/QC samples provide an evaluation of both the laboratory's and the field sampling team's performance. Including QA/QC samples in a sampling design allows for identifying and measuring sources of error potentially introduced from the time of sample container preparation through analysis. The most common QA/QC samples collected in the field are collocated field duplicates, field replicates, equipment blanks, field blanks and trip blanks. Extra volume/mass is collected for a matrix spike/matrix spike duplicate (MS/MSD) at a frequency of 5% (one in 20 samples). Spiking is performed in the laboratory. For additional information or other QA/QC samples pertinent to sample analysis, refer to SERAS SOP #2005, *Quality Assurance/Quality Control Samples*.

Collocated field duplicates may be collected based on site objectives and used to measure variability associated with the sampling process including sample heterogeneity, sampling methodology, and analytical procedures. Field replicates are field samples obtained from one location, homogenized, and divided into separate containers. This is useful for determining whether the sample has been homogenized properly. Equipment blanks (also known as rinsate blanks) are typically collected at a rate of one per day. The equipment blank is used to evaluate the relative cleanliness of non-dedicated equipment.

3.5 Sample Containers, Preservation, Storage and Holding Times

The amount of sample to be collected, the proper sample container type (i.e., glass, plastic), chemical preservation, and storage requirements are dependent on the matrix sampled and the analyses to be conducted. This information is provided in SERAS SOP #2003, *Sample Storage, Preservation, and Handling*. Field personnel need to be cognizant of any short holding times that warrant immediate shipment/transfer to the laboratory.

3.6 Documentation

Field conditions and site activities must be documented. Scribe will be used to document sample locations and generate chain of custody records. Other field measurements not typically entered into Scribe will be documented in a site-specific logbook or in a personal logbook. All sample documentation will be maintained in accordance with SERAS SOP #2002, *Sample Documentation* and SERAS SOP #4005, *Chain of Custody Procedures.*

4.0 RESPONSIBILITIES

4.1 SERAS Task Leaders

Task Leaders (TLs) are responsible for the overall management of the project. Task Leader responsibilities include ensuring that field personnel are well informed of the sampling requirements for a specific project and that SOP and QA/QC procedures stated in the site-specific QAPP are adhered to, issuing a Field Change Form that documents any changes to sampling activities after the QAPP has been approved and maintaining sample documentation.

4.2 SERAS Field Personnel

Field personnel are responsible for reading the QAPP prior to site activities and performing sample collection activities as written. They are responsible for notifying the TL of deviations from sample collection protocols which occurred during the execution of sampling activities. Field staff will collect samples and prepare documentation in accordance with SERAS SOP #2002, *Sample Documentation*. In addition, field personnel are responsible for reading and conforming to the approved site-specific Health and Safety Plan (HASP).

4.3 SERAS Program Manager

The SERAS Program Manager is responsible for the overall technical and financial management of the project.

4.4 SERAS QA/QC Officer

The QA/QC Officer is responsible for reviewing this SOP and ensuring that the information in this SOP is updated on a timely basis. Compliance to this SOP may be monitored by either conducting a field audit or reviewing deliverables prepared by the SERAS TL.

4.5 Health and Safety (H&S) Officer

The H&S Officer is responsible for ensuring that a HASP has been written in conformance with SOP # 3012, *SERAS Health and Safety Guidelines for Field Activities* and approved prior to field activities. Additionally, the H& S Officer is responsible for ensuring that SERAS site personnel's H&S training is current as per SOP # 3006, *SERAS Field Certification Program* and that their medical monitoring is current as per *SERAS SOP #3004, SERAS Medical Monitoring Program.*

STANDARD OPERATING PROCEDURE APPROVAL AND CHANGE FORM

Scientific, Engineering, Response and Analytical Services 2890 Woodbridge Avenue Building 209 Annex Edison New Jersey 08837-3679	
STANDARD OPERATING PROCEDURE	
Title: Sampling Equipment Decontamination	
Approval Date: 12/28/2015	
Effective Date: 12/28/2015	SERAS SOP Number 2006, Rev 1.0
Authors	
Name Christopher French Title SERAS Environmental Technician Signature	Date 12/28/15
Name Christopher Gussman Title SERAS Phytoremediation Scientist Signature	Date 12/28/15
Approvals	
Name Richard Leuser Title SERAS Deputy Program Manager Signature	Date 12/28/2015
Name Deborah Killeen Title SERAS QA/QC Officer Signature	Date 12/23/15
Name Kevin Taylor Title SERAS Program Manager Signature	Date 12/28/15

The top row of this table shows the most recent changes to the controlled document. For previous revision history information, archived versions of this document are maintained by the SERAS QA/QC Officer on the SERAS local area network (LAN).

History	Effective Date
Supersedes: SOP #2006, Revision 0.0, 08/11/94	12/28/15
Complete Rewrite - Updated all sections of the SOP	12/28/15

SAMPLING EQUIPMENT DECONTAMINATION

CONTENTS

CONTENTS (cont'd)

SUPERSEDES: SOP #2006, Rev. 0.0, 08/11/94; US EPA Contract EP-W-09-031

SAMPLING EQUIPMENT DECONTAMINATION

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to describe the methods for preventing or limiting cross-contamination of samples due to inappropriate or inadequate equipment decontamination and to provide general guidelines for developing decontamination procedures for sampling equipment to be used during environmental investigations as per 29 Code of Federal Regulations (CFR) 1910.120. This SOP does not address personnel decontamination.

A Quality Assurance Project Plan (QAPP) in Uniform Federal Policy (UFP) format describing the project objectives must be prepared prior to deploying for a sampling event. The sampler needs to ensure the methods used are adequate to satisfy the data quality objectives.

The procedures in this SOP may be varied or changed as required, dependent on site conditions, equipment limitations or other procedural limitations. In all instances, the procedures employed must be documented on a Field Change Form and attached to the QAPP. These changes must be documented in the final deliverable.

2.0 METHOD SUMMARY

Removing or neutralizing contaminants from equipment minimizes the possibility of sample cross contamination, reduces or eliminates transfer of contaminants to clean areas, and prevents the mixing of incompatible substances. Some equipment may have specific decontamination procedures that do not follow this SOP. Refer to the user manual for each piece of equipment before utilizing this SOP.

Gross contamination can be removed by physical decontamination procedures. These abrasive and non-abrasive methods include the use of brushes and high and low pressure water cleaning.

The first step is the physical removal of gross contamination on sampling equipment which may include steam or a high pressure water wash. The second step is a soap and water wash that removes the remainder of visible material and residual oils and grease. The third step involves a potable water rinse to remove any detergent, followed by a distilled/deionized water rinse.

For the removal of metals, an acid rinse with a 10% nitric acid solution is used prior to the final distilled/deionized water rinse. For the removal of organics, pesticide grade acetone, methanol or hexane, depending on the specific contaminant of concern, will be applied prior to the final distilled/deionized rinse. Acetone is typically chosen because it is excellent at removing organics, miscible in water, and not a target analyte on the Priority Pollutant List. If acetone is known to be a contaminant of concern or if Target Compound List analysis (which includes acetone) is to be performed, another solvent such as methanol will need to be substituted.

Hexane should be used when the contaminant of concern is polychlorinated biphenyls (PCBs) or in oily media. The solvent must be allowed to evaporate completely and then a final distilled/deionized water rinse is performed. This rinse removes any residual traces of the solvent.

A generalized decontamination procedure is:

1. Physical removal
2. Non-phosphate detergent wash with potable water
3. Potable water rinse
4. Solvent rinse (acetone, hexane, etc.)

5. Air dry
6. 10% nitric acid solution rinse
7. Distilled/deionized water rinse
8. Air dry

In instances in which sampling equipment is being used to collect samples for biological pathogens, the acid is replaced with a 10% bleach solution. Modifications to the standard procedure are required to be documented in the site-specific QAPP, field log book and subsequent reports. All decontamination water is replaced daily at a minimum. If at any point throughout the day the water becomes too dirty, then it is no longer suitable for cleaning and is required to be replaced. All sampling equipment is required to be decontaminated before collecting samples on-site and after use of each piece of sampling equipment.

Waste materials generated from the decontamination processes are referred to as Investigation-Derived Waste (IDW). Management of this waste should be in coordination with SOP#2049, *Investigative-Derived Waste Management.*

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

The amount of sample collected, along with the proper sample container type (i.e. glass, plastic), chemical preservation, and storage requirements are dependent upon the matrix sampled and analysis performed. For further information, refer to SERAS SOP #2003, *Sample Storage, Preservation and Handling*.

Sample collection and analysis of decontamination waste generated on-site may be required prior to disposal of decontamination liquids and solids. This should be determined prior to initiation of site activities or as soon as possible thereafter. For more information on handling of IDW, refer to SOP#2049, *Investigative-Derived Waste Management*.

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

Acetone is an excellent solvent since it is miscible with water; however, if volatile organic compounds (VOCs) are to be analyzed, the use of an alternate solvent (methanol, hexane) should be considered since acetone is a compound on the Target Compound List (TCL).

The use of deionized (distilled if only option) water is required for decontamination of sampling equipment. In addition, that water is required to be lab certified, analyte free (specifically for the contaminants of concern). The deionized water must be secured prior to field activities as it is not commonly found local to the site.

The use of solvents and acids on sensitive sampling equipment may cause damage. It is important avoid damaging the equipment. If acids or solvents are utilized, follow health and safety, and waste disposal guidelines.

When decontaminating equipment when temperatures are below freezing, water will freeze in pump spray hoses lines, tanks and in buckets/pails, etc. Additionally, equipment will require longer drying times.

Do not store sampling equipment or reagents used for decontamination near gasoline or any exhaust emissions. Improperly cleaned and prepared sampling equipment can lead to misinterpretation of analytical data due to cross contamination.

SAMPLING EQUIPMENT DECONTAMINATION

Make sure that the decontamination station is set up as not to compromise a clean environment.

5.0 EQUIPMENT/APPARATUS

Decontamination equipment is selected based on the type of equipment to be cleaned and anticipated contaminants to be removed. For example, soft-bristle scrub brushes or long-handled bottle brushes are used to remove contaminants. Large galvanized wash tubs, stock tanks, buckets, or children's wading pools hold wash and rinse solutions. Large plastic garbage cans or other similar containers lined with plastic bags help segregate contaminated equipment. Drums are used to store liquid and solid site derived waste.

The following standard materials and equipment are recommended for decontamination activities:

-

5.1 Decontamination Tools/Supplies

- Long and short handled brushes
- Bottle brushes, composed of nonmetallic material such as nylon
- Plastic sheeting
- Paper towels
- Plastic or galvanized tubs or buckets
- Pressurized sprayers filled with potable water
- Spray bottles
- Aluminum foil
- Pressure washer
- Garden hose
- Electrical cords
- Work lights (if working in the dark)
- Generator (if using a submersible pump or lights)
- Water tank
- Sump pump

5.2 Health and Safety Equipment

The use of personal protective equipment (PPE), (i.e. safety glasses or splash shield, Tyvek® suits, nitrile gloves, aprons or coveralls, steel toe boots, etc.), is required. Refer to the site-specific Health and Safety Plan (HASP) for site-specific requirements.

5.3 Waste Disposal

- Trash bags
- 55-gallon drums (open and closed top types)
- Metal/plastic buckets/containers for storage and disposal of decontamination solutions

6.0 REAGENTS

Table 1 (Appendix A) lists solvents recommended for the elimination of particular chemicals. In general, solvents typically utilized during the decontamination process are:

- 10% Nitric Acid (HNO_3), typically used for inorganic compounds such as metals
- Acetone (pesticide grade)
- Hexane (pesticide grade)
- Methanol (pesticide grade)
- Deionized/Distilled Water that meets ASTM Type II specifications
- Non-Phosphate Detergent
- Potable Water

7.0 PROCEDURES

A decontamination area should be set up prior to sampling. Weather conditions (i.e. hot, cold, rain, snow, etc.) play an important role in the decontamination process. In hot, cold, rainy or snowy conditions, a tent or canopy may be erected around and over the decontamination area. In cold environments, the decontamination may need to occur inside a building or portable heaters may be needed to warm the area under the tent or canopy. In addition, in cold environments the potable and deionized water may freeze. Plan accordingly and consider your working conditions prior to field sampling activities.

A decontamination plan needs to be implemented and includes:

- The number, location, and layout of decontamination stations
- Decontamination equipment
- Selection of appropriate decontamination methods
- Methods of disposal of all investigative derived waste (i.e. PPE, solid and liquid waste, etc.)
- Work practices that minimize contact with potential contaminants.
- Protection procedures for monitoring and sampling equipment (i.e. covering with plastic, etc.)
- Considerations related to weather conditions
- The use of disposable sampling equipment, when possible

7.1 Decontamination Methods

All samples and equipment removed from site must be decontaminated, removing all contamination that may have adhered to the equipment. Various decontamination methods remove contaminants by washing with water and another physical cleaning action. In addition, solvents and/or acids may be used to decontaminate the equipment.

Physical decontamination methods are grouped into two categories, abrasive and non-abrasive methods, and are listed below:

7.1.1 Abrasive Cleaning Methods

Abrasive cleaning methods work by rubbing and wearing away the top layer of the surface containing the contaminant. It involves the use of metal or nylon brushes. The amount and type of contaminants removed will vary with the brush type, length of time brushed,

degree of brush contact, degree of contamination, nature of the contaminant and surface being cleaned.

7.1.2 Non-Abrasive Cleaning Methods

Non-abrasive cleaning methods work by forcing the contaminant off a surface with water pressure (i.e. sprayer or pressure washer).

Low-Pressure Water

This method consists of a pressure sprayer filled with water. The user pumps air into the sprayer tank to create pressure. The water is then discharged through a slender nozzle and hose, cleaning the equipment. Scrubbing with a brush is typically used in conjunction with this method.

High-Pressure Water

This method consists of the use of a pressure washer. The operator controls the directional nozzle which is attached to a high-pressure hose. Operating pressure usually ranges from 400 – 600 pounds per square inch (PSI). Scrubbing with large brushes can be used to aid in the decontamination process.

Rinsing

Contaminants and any remaining solvents and/or acids are removed by thorough rinsing. The rinsing is done either by the use of a sprayer or a pressure washer depending on the equipment being cleaned.

Damp Cloth Removal

In some instances, due to sensitive, non-waterproof equipment or due to the unlikelihood of equipment being contaminated, it is not necessary to conduct an extensive decontamination procedure. For example, air sampling pumps attached to a fence, placed on a drum, or equipment protected by plastic or some other material are not likely to become heavily contaminated.

A damp cloth is used to wipe off any contaminants which may have adhered to equipment through airborne contaminants or from surfaces upon which the equipment was set. The use of a different cleaning cloth for each piece of equipment is required. Upon completion, dispose of all cloths with the site derived waste.

7.2 Field Sampling Equipment Decontamination Procedures

7.2.1 Decontamination Setup

The decontamination area is set up by laying out a section of plastic sheeting large enough for the type and amount of equipment to be decontaminated and for the equipment drop and equipment air drying areas.

Stage brushes, pressure sprayers, spray bottles (w/appropriate solvents, acids and deionized water), 5-gallon buckets, plastic/galvanized wash tubs, pressure washer (if required) and detergent. Figure 1 (Appendix B) shows the decontamination area overall layout. Section 7.2.2 discusses the decontamination procedures depending on the contaminants of concern for a Site.

Stage the appropriate amount and type of sample bottles and a cooler, for the collection of rinsate samples. For specific rinsate sample information, refer to SERAS SOP #2005, *Quality Assurance/Quality Control Samples.*

7.2.2 Decontamination Procedures

There are various stations of the cleaning process in which the equipment move through that are designed to remove all visible contamination. Stations 1 and 2 are designed to remove all visible contamination. Additional stations after 1 and 2 remove materials that require dissolution and a final rinse. Once the equipment has passed through all stations, it is laid out to air dry.

Decontamination Process for Metals

Station 1 - Place the sampling equipment into the soapy water solution and thoroughly scrub with brushes or pressure washer. When there is no visible residue remaining, transfer to Station 2.

Station 2 - Rinse the equipment in the bucket/tub with potable water. Then remove from the bucket/tub and rinse with the pressure sprayer. When satisfied with the cleanliness of the sampling equipment, transfer to Station 3.

Station 3 - Apply the acid solution and air dry on the plastic sheeting, behind Station 3. Once equipment has fully dried, transfer to Station 4.

Station 4 - Rinse the equipment with the pressure sprayer filled with deionized water. When satisfied the rinsing process is complete, transfer to the equipment drying area. After drying, the equipment should be wrapped in aluminum foil to prevent contamination of the equipment.

Decontamination Process for Organics

Station 1 - Place the sampling equipment into the soapy water solution and thoroughly scrub with brushes. When there is no visible residue remaining, transfer to Station 2

Station 2 - Rinse the equipment in the bucket/tub with potable water. Then remove from the bucket/tub and rinse with the pressure sprayer. When satisfied with the cleanliness of the sampling equipment, transfer to Station 3.

Station 3 - Apply the appropriate solvent or solvents and air dry on the plastic sheeting, behind Station 3. Once equipment has fully dried, transfer to Station 4.

Station 4 - Rinse the equipment with the pressure sprayer filled with deionized water. When satisfied the rinsing process is complete, transfer to the equipment drying area.

Decontamination process for Metals and Organics

Station 1 - Place the sampling equipment into the soapy water solution and thoroughly scrub with brushes. When there is no visible residue remaining, transfer to Station 2.

Station 2 - Rinse the equipment in the bucket/tub with potable water. Then remove from the bucket/tub and rinse with the pressure sprayer. When satisfied with the cleanliness of the sampling equipment, transfer to Station 3.

Station 3 - Apply the acid solution and transfer to Station 4.

Station 4 - Rinse the equipment with the pressure sprayer filled with deionized water. When satisfied the rinsing process is complete, transfer to Station 5.

Station 5- Apply the solvent or solvents and air dry on the plastic sheeting behind Station 5. Once equipment has fully dried, transfer to Station 6.

Station 6 - Rinse the equipment with the pressure sprayer filled with deionized water. When satisfied the rinsing process is complete, transfer to the equipment drying area. After drying, the equipment should be wrapped in aluminum foil to prevent contamination of the equipment.

7.2.3 Post Decontamination Procedures

1. Fill out the appropriate labels for the all the various wastes and affix the labels to the drums and/or containers.
2. Clean up the entire work area. Collect solid waste (i.e. nitrile gloves, plastic sheeting, etc.) and store in an appropriate DOT certified drum.
3. Return any remaining unused solvents or acid solutions to their respective labeled containers and properly store.
4. Transfer potable water rinse waste into an appropriate Department of Transportation (DOT) certified drum or container.
5. Transfer the solvent and acid solution rinse water waste into the appropriately labeled DOT certified drums or containers.
6. Using a pressure sprayer, rinse the basins/buckets.
7. Transfer liquid generated from this process into the potable water rinse waste container.
8. Transfer the decontamination brushes into the solid waste container.

9. Empty the pressure sprayer filled with potable water onto the ground.

10. Return all equipment into their carrying cases or shipping containers.

11. Make arrangements for the pickup of all liquid and solid waste.

For further information on waste disposal, refer to SERAS SOP 2049, *Investigation Derived Waste Management*.

7.3 Decontamination of Earth Moving Equipment/Drilling Equipment and Accessories

The decontamination of earth moving and/or drilling equipment and their accessories will require the use of a pressure washer. In addition, an on-site water supply will need to be available. If an on-site water supply is not available, a water tank along with a pump, hoses and a generator will be required. Finally, a designated area on-site needs to be designated as a decontamination area. Some sites already have a concrete pad set-up for this very purpose. If this is not the case, work with the Work Assignment Manager (WAM) to assign a location for these activities to take place on-site.

An area for decontamination can be built with 4x4 lumber or hay bales, heavy duty plastic sheeting and a sump pump. The area will need to extend at least 4 feet beyond the outer dimensions of the equipment being cleaned. Either slope the decontamination area down to one corner or dig a small hole about 2 feet by 2 feet square and about 2 feet deep to allow for the collection of the decontamination water. Cover the decontamination area with plastic sheeting, wrapping the sides around and under the 4 x 4 lumber or bales of hay. If equipment being decontaminated includes equipment with tracks that might tear through the plastic sheeting, appropriate surfaces need to be included for the equipment to drive on. Finally, place a sump pump into this area and periodically empty the water as necessary, into the appropriately labeled liquid waste drum.

7.3.1 Decontamination Set-up Procedures:

1. Move the equipment into the decontamination area.

2. Stage all the decontamination equipment and supplies (i.e. Pressure Washer, Hoses, PPE, etc.)

3. Connect all hoses and fill the pressure washer with fuel.

4. Dress out in the appropriate PPE (refer to the site-specific HASP).

At a minimum, Tyvek®, safety glasses/goggles, steel toe boots, and nitrile gloves must be worn. If handling any equipment (i.e. drill rods, etc.) work gloves must also be worn to prevent possible injury. For site specific requirements refer to the site-specific HASP.

7.3.2 Decontamination Cleaning Procedures:

1. Physically remove as much of the visible material as possible from the heavy equipment after use and prior to steam cleaning. If contaminated material is suspected as determined by visual observations, instrument readings, or other means, collect material in an appropriate waste container.

2. Place the heavy equipment on the decontamination pad in the decontamination area. Verify the decontamination pad has no leaks and the sump pump is functioning properly before beginning the decontamination process.

3. Power on the pressure washer and begin cleaning from the top to the bottom. Thoroughly clean parts of the heavy machinery that come into contact with visible material (such as tires, bucket, augers, drill rods, tracks and the back and underneath of the drill rig). Scrub areas with excessive dirt/debris with large bristle brushes. A flat head shovel can be used to aide in the removal of the dirt/debris. Continue cleaning until all visible contamination has been removed. If required, apply solvents and/or acid solutions, rinse with deionized/distilled water and then let air dry.

The use of solvents and/or acid solutions will depend on site specific conditions. Check with the site-specific HASP for further guidance.

7.3.3 Post Decontamination Procedures

1. Fill out the appropriate labels for the all the various wastes and affix the labels to the drums and/or containers

2. Transfer potable water rinse waste into an appropriate Department of Transportation (DOT) certified drum or container. Transfer water from the decontamination pad to the liquid waste drums using a sump pump.

3. Collect and transfer solid waste (i.e. nitrile gloves, plastic sheeting, etc.) to a DOT-certified drum or container.

4. Transfer the solvent and acid solution rinse water waste into the appropriately labeled DOT-certified drums or containers.

5. Make arrangements for the pickup of all liquid and solid waste.

For further information on waste disposal, refer to SERAS SOP 2049, *Investigation Derived Waste Management*.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

Documentation of the decontamination process including date, time and personnel that conducted the decontamination activities must be recorded in a field logbook. Record manufacturer and lot numbers of the reagents used for the decontamination procedures.

A rinsate blank is a specific type of quality control sample associated with the field decontamination process. This sample will provide information on the effectiveness of the decontamination process employed in the field. Rinsate blanks are samples obtained by pouring analyte free deionized water over previously

decontaminated sampling equipment, testing for residual contamination. The blank water is then collected in sample containers, processed, shipped and analyzed. The rinsate blank is used to assess possible cross-contamination caused by improper decontamination procedures. The most common frequency of collection is one rinsate blank per day per type of sampling device, to meet definitive data objectives. For further information for each analysis, refer to SERAS SOP #2005, *Quality Assurance/Quality Control Samples*.

For information on sample container types and preservation, refer to SERAS SOP #2003, *Sample Storage, Preservation and Handling*.

If sampling equipment requires the use of Teflon® or polyethylene tubing it is required to be disposed of into the on-site waste container and replaced with clean tubing before additional sampling occurs.

10.0 DATA VALIDATION

Data verification (completeness checks) must be conducted to ensure that all data inputs are present for ensuring the availability of sufficient information. These data are essential to providing an accurate and complete final deliverable. Results of quality control samples will be evaluated for possible cross-contamination of improperly or inadequately decontaminated sampling equipment. This data will be utilized to quantify the sample results in accordance with the project's data quality objectives. The SERAS Task Leader (TL) is responsible for completing the UFP-QAPP verification checklist for each project.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow Occupational Safety and Health (OSHA), U.S. EPA, corporate, and other applicable health and safety procedures.

The decontamination process can pose hazards under certain circumstances. Hazardous substances may be incompatible with decontamination materials. For example, the decontamination solution may react with contaminants to produce heat, explosion, or toxic products. Also, vapors from decontamination solutions may pose a direct health hazard to workers by inhalation, contact, fire, or explosion.

The decontamination solutions must be determined to be acceptable before their use. Decontamination materials may degrade protective clothing or equipment and some solvents can permeate protective clothing. If decontamination materials pose a health hazard, measures are to be taken to protect personnel. Alternatively, substitutions can be made to eliminate the hazard. The choice of respiratory protection based on contaminants of concern from the site may not be appropriate for solvents used in the decontamination process. Material generated from decontamination activities requires proper handling, storage, and disposal. PPE may be required for these activities.

Safety data sheets (SDS) are required for all decontamination solvents or solutions as required by the Hazard Communication Standard (i.e. acetone, alcohol, etc.).

12.0 REFERENCES

Field Sampling Procedures Manual, New Jersey Department of Environmental Protection, August 2005.

Compendium of Superfund Field Operations Methods, EPA 540/p-87/001.

SAMPLING EQUIPMENT DECONTAMINATION

The Field Branches Quality System and Technical Procedures – Field Equipment Cleaning and Decontamination, USEPA Region IV Science and Ecosystem Support Division, November 2007.

Guidelines for the Selection of Chemical Protective Clothing, Volume 1, Third Edition, American Conference of Governmental Industrial Hygienists, Inc., February 1987.

Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities, NIOSH/OSHA/USCG/EPA, October 1985.

APPENDIX A
Tables
SOP #2006
December 2015

SAMPLING EQUIPMENT DECONTAMINATION

TABLE 1. Soluble Contaminants and Recommended Solvent Rinse

SOLVENT[1]	EXAMPLES OF SOLVENTS	SOLUBLE CONTAMINANTS
Water	Deionized water Potable water	Low-chain hydrocarbons Inorganic compounds Salts Some organic acids and other polar compounds
Dilute Acids	Nitric acid Acetic acid Boric acid	Basic (caustic) compounds (e.g., amines and hydrazine's) and inorganic compounds.
Dilute Bases	Sodium bicarbonate	Acidic compounds Phenol Thiols Some nitro and sulfonic compounds
Organic Solvents [2]	Acetone Alcohols Ketones Aromatics Alkanes (e.g., hexane) Common petroleum products (i.e. fuel, oil, kerosene)	Nonpolar compounds (e.g., some organic compounds)
Organic Solvent[2]	Hexane	PCBs

[1] - Safety data sheets are required for all decontamination solvents or solutions as required by the Hazard Communication Standard

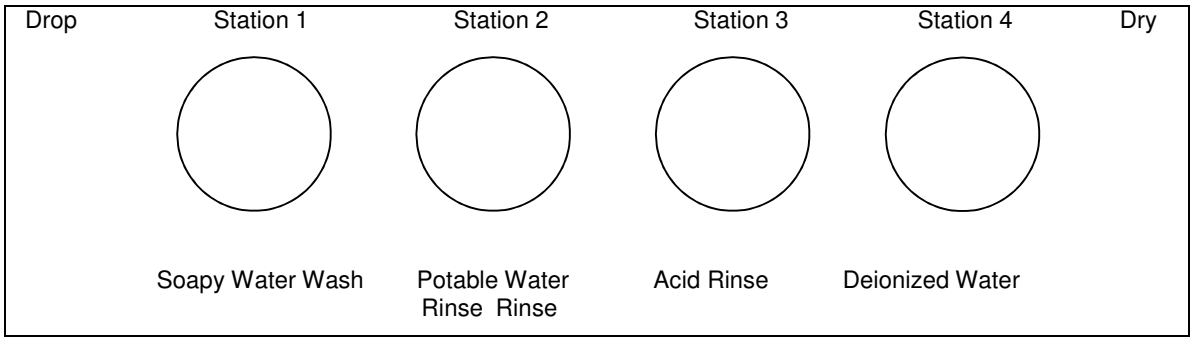
[2] - WARNING: Some organic solvents can permeate and/or degrade protective clothing

APPENDIX B
Figures
SOP #2006
December 2015

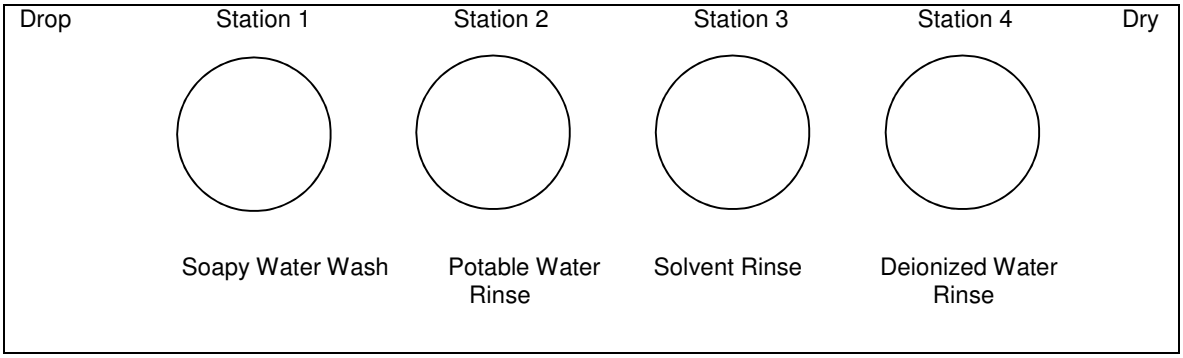
SAMPLING EQUIPMENT DECONTAMINATION

FIGURE 1. Sampling Equipment Decontamination Area

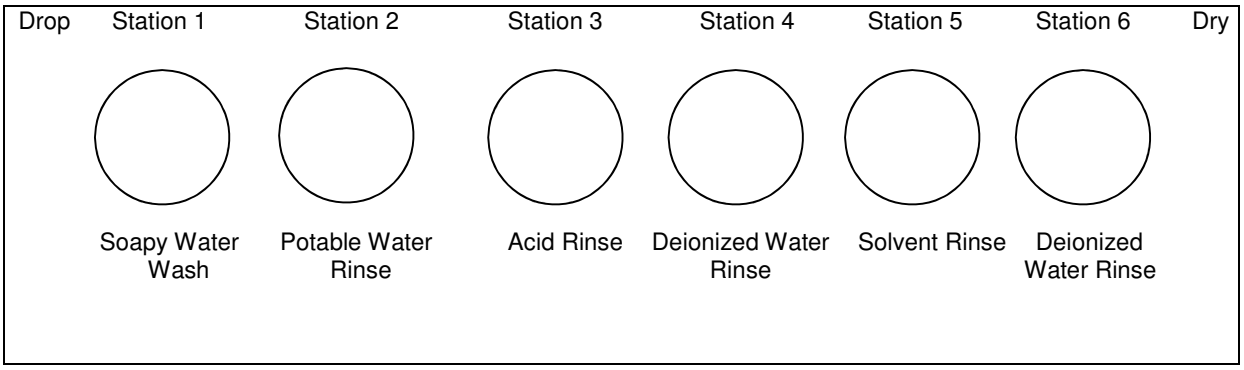
Configuration for the Removal of Metals



Configuration for the Removal of Organics



Configuration for the Removal of Metals and Organics



SOIL SAMPLING

CONTENTS

*These sections affected by Revision 1.0.

SUPERCEDES: SOP #2012; Revision 0.0; 2/18/00; U.S. EPA Contract 68-C99-223.

1.0 SCOPE AND APPLICATION

The purpose of this Standard Operating Procedure (SOP) is to describe procedures for the collection of representative surface soil samples. Sampling depths are assumed to be those that can be reached without the use of a drill rig, direct-push technology, or other mechanized equipment (except for a back-hoe). Sample depths typically extend up to 1-foot below ground surface. Analysis of soil samples may define the extent of contamination, determine whether concentrations of specific contaminants exceed established action levels, or if the concentrations of contaminants present a risk to public health, welfare, or the environment.

These are standard (i.e., typically applicable) operating procedures which may be varied or changed as required, dependent upon site conditions, equipment limitations, or limitations imposed by the procedure. In all instances, the ultimate procedures employed should be documented and associated with a final report.

Mention of trade names or commercial products does not constitute United States Environmental Protection Agency (U.S. EPA) endorsement or recommendation for use.

2.0 METHOD SUMMARY

Surface soil samples can be used to investigate contaminants that are persistent in the near surface environment. Contaminants that are detected in the near surface environment may extend to considerable depths, may migrate to the groundwater, surface water, the atmosphere, or may enter biological systems.

Soil samples may be collected using a variety of methods and equipment depending on the depth of the desired sample, the type of sample required (discrete or composite), and the soil type. Near-surface soils may be easily sampled using a spade, trowel, and/or scoop. Sampling at greater depths may be performed using a hand auger, continuous-flight auger, trier, split-spoon sampler, or, if required, a backhoe.

3.0 SAMPLE PRESERVATION, CONTAINERS, HANDLING, AND STORAGE

Samples must be cooled and maintained at 4^{o}C and protected from sunlight immediately upon collection to minimize any potential reaction. The amount of sample to be collected, proper sample container type and handling requirements are discussed in the Scientific, Engineering, Response Analytical Services (SERAS) SOP #2003, *Sample Storage, Preservation and Handling.*

4.0 INTERFERENCES AND POTENTIAL PROBLEMS

There are two primary problems associated with soil sampling: 1) cross contamination of samples, and 2) improper sample collection. Cross contamination problems can be eliminated or minimized through the use of dedicated sampling equipment. If this is not possible or practical, decontamination of sampling equipment is necessary. The guidelines for preventing, minimizing and limiting cross contamination of samples are discussed in the Environmental Response Team (ERT)/SERAS SOP #2006, *Sampling Equipment Decontamination*. Improper sample collection procedures can disturb the sample matrix, resulting in volatilization of contaminants, compaction of the sample, or inadequate homogenization of the samples (when required), resulting in variable, non-representative results.

5.0 EQUIPMENT/APPARATUS

Soil sampling equipment includes the following:

- Site maps/plot plan
- Safety equipment, as specified in the site-specific Health and Safety Plan (HASP)
- Traditional survey equipment or global positioning system (GPS)
- Tape measure
- Survey stakes or flags
- Camera and image collection media
- Stainless steel, plastic*, or other appropriate homogenization bucket, bowl or pan
- Appropriate size sample containers
- Ziplock plastic bags
- Site logbook
- Labels
- Chain of Custody records and custody seals
- Field data sheets and sample labels
- Cooler(s)
- Ice
- Vermiculite
- Decontamination supplies/equipment
- Plastic sheeting
- Spade or shovel
- Spatula(s)
- Scoop(s)
- Plastic* or stainless steel spoons
- Trowel(s)
- Continuous flight (screw) auger
- Bucket auger
- Post hole auger
- Extension rods
- T-handle
- Sampling trier
- Thin wall tube sampler
- Split spoon sampler
- Soil core sampler
  - Tubes, points, drive head, drop hammer, puller jack and grip
- Photoionization detector (PID), Flame ionization detector (FID) and/or Respirable Aerosol Monitor (RAM)

- Backhoe (as required)
- En Core® samplers

* Not used when sampling for semivolatile compounds.

6.0 REAGENTS

Decontamination solutions are specified in ERT/SERAS SOP #2006, *Sampling Equipment Decontamination*, and the site specific work plan.

7.0 PROCEDURES

7.1 Preparation

1. Determine the extent of the sampling effort, the analytes to be determined, the sampling methods to be employed, and the types and amounts of equipment and supplies required to accomplish the assignment.

2. Obtain the necessary sampling and air monitoring equipment.

3. Prepare schedules and coordinate with staff, client, and regulatory agencies, as appropriate.

4. Perform a general site reconnaissance survey prior to site entry in accordance with the site specific HASP.

5. Use stakes or flags to identify and mark all sampling locations. Specific site factors, including extent and nature of contamination, should be considered when selecting sample locations. If required, the proposed locations may be adjusted based on site access, property boundaries, and surface obstructions. All staked locations should be utility-cleared prior to soil sampling; utility clearances must be confirmed before beginning intrusive work.

6. Pre-clean and decontaminate equipment in accordance with the site specific work plan, and ensure that it is in working order.

7.2 Sample Collection

7.2.1 Surface Soil Samples

The collection of samples from near-surface soil can be accomplished with tools such as spades, shovels, trowels, and scoops. The over-burden or over-lying surface material is removed to the required depth and a stainless steel or plastic scoop is used to collect the sample. Plastic utensils are not to be used when sampling for semivolatile compounds.

This method can be used in most soil types but is limited to sampling at or near the ground surface. Accurate, representative samples can be collected by this procedure depending on the care and precision demonstrated by the sample team member. A flat, pointed mason trowel to cut a block of the desired soil is helpful when undisturbed profiles are required. Tools plated with chrome or other materials must not be used.

The following procedure is used to collect surface soil samples:

1. If volatile organic compound (VOC) contamination is suspected, use a PID to monitor the sampler's breathing zone during soil sampling activities.

2. Using a pre-cleaned, stainless steel scoop, plastic spoon, or trowel, remove and discard sticks, rocks, vegetation and other debris from the sampling area.

3. Accumulate an adequate volume of soil, based on the type(s) of analyses to be performed, in

a stainless, plastic or other appropriate container.

4. If volatile organic analysis is to be performed, immediately transfer the sample directly into an appropriate, labeled sample container with a stainless steel spoon, or equivalent, and secure the cap tightly to ensure that the volatile fraction is not compromised. Thoroughly mix the remainder of the soil to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly, or, if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.2 Sampling at Depth with Augers and Thin Wall Tube Samplers

This system consists of an auger, head, a series of extensions, and a "T" handle (Figure 1, Appendix A). The auger is used to bore a hole to a desired sampling depth, and is then withdrawn. The sample may be collected directly from the auger head. If additional sample volume is required, multiple grabs at the same depth are made. If a core sample is to be collected, the auger head is then replaced with a tube auger. The system is then lowered down the borehole, and driven into the soil to the completion depth. The system is withdrawn and the core is collected.

Several types of augers are available; these include bucket or tube type, and continuous flight (screw) or post-hole augers. Bucket or tube type augers are better for direct sample recovery because a large volume of sample can be collected from a discrete area in a short period of time. When continuous flight or post-hole augers are used, the sample can be collected directly from the flights or from the borehole cuttings. The continuous flight or post-hole augers are satisfactory when a composite of the complete soil column is desired, but have limited utility for sample collection as they cannot be used to sample a discrete depth.

The following procedure is used for collecting soil samples with an auger:

1. Attach the auger head to an extension rod and attach the "T" handle.

2. Clear the area to be sampled of surface debris (e.g., twigs, rocks, litter). It may be advisable to remove a thin layer of surface soil for an area approximately six inches in radius around the sampling location.

3. Begin augering, periodically removing and depositing accumulated soils onto a plastic sheet spread near the hole. This prevents the accidental brushing of loose material back down the borehole when removing the auger or adding extension rods. It also facilitates refilling the hole, and avoids possible contamination of the surrounding area.

4. After reaching the desired depth, slowly and carefully remove the auger from the hole. When sampling directly from the auger head, proceed to Step 10.

5. Remove auger tip from the extension rods and replace with a tube sampler. Install the

proper cutting tip.

6. Carefully lower the tube sampler down the borehole. Gradually force the tube sampler into the soil. Do not scrape the borehole sides. Avoid hammering the rods as the vibrations may cause the boring walls to collapse.

7. Remove the tube sampler and unscrew the extension rods.

8. Remove the cutting tip and the core from the device.

9. Discard the top of the core (approximately 1 inch), as this possibly represents material collected before penetration of the layer of concern. Place the core or a discrete portion of the core into the appropriate labeled sample container using a clean, decontaminated stainless steel spoon. If required, homogenize the sample as described in Step 10.

10. If VOC analysis is to be performed, transfer the sample directly from the auger head into an appropriate, labeled sample container with a stainless steel spoon, or equivalent and secure the cap tightly.

11. If another sample is to be collected in the same hole, but at a greater depth, reattach the auger head to the drill assembly, and follow steps 3 through 11, making sure to decontaminate the auger head and tube sampler between samples.

12. Abandon the hole according to applicable state regulations.

7.2.3 Sampling at Depth with a Trier

The system consists of a trier and a "T" handle. The auger is driven into the soil to be sampled and used to extract a core sample from the appropriate depth.

The following procedure is used to collect soil samples with a sampling trier:

1. Insert the trier (Figure 2, Appendix A) into the material to be sampled at a zero degree to forty-five degree (0^{o} to 45^{o}) angle from the soil surface plane. This orientation minimizes the spillage of sample.

2. Rotate the trier once or twice to cut a core of material.

3. Slowly withdraw the trier, making sure that the slot is facing upward.

4. If VOC analyses are required, transfer the sample directly from the trier into an appropriate, labeled sample container with a stainless steel spoon, or equivalent device and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container and mix thoroughly to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; if composite samples are to be collected, place a sample from another sampling interval into the

homogenization container and mix thoroughly. When compositing is complete, place the sample into appropriate, labeled containers and secure the caps tightly.

7.2.4 Sampling at Depth with a Split Spoon (Barrel) Sampler

Split spoon sampling is generally used to collect undisturbed soil cores of 18- or 24- inches in length. A series of consecutive cores may be extracted with a split spoon sampler to give a complete soil column profile, or an auger may be used to drill down to the desired depth for sampling. The split spoon is then driven to its sampling depth through the bottom of the augured hole and the core extracted.

When split spoon sampling is performed to gain geologic information, all work should be performed in accordance with American Society for Testing and Materials (ASTM) D1586-99, "*Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils".*

The following procedures are used for collecting soil samples with a split spoon:

1. Assemble the sampler by aligning both sides of the barrel and then screwing the drive shoe on the bottom and the head piece on top.

2. Place the sampler at a 90 degree (90^{o}) angle to the sample material.

3. Using a well ring, drive the sampler. Do not drive past the bottom of the head piece or compression of the sample will result.

4. Record in the site logbook or on field data sheets the length of the tube used to penetrate the material being sampled, and the number of blows required to obtain the sample.

5. Withdraw the sampler, and open it by unscrewing the bit and head, and then splitting the barrel. The amount of recovery and soil type should be recorded on the boring log. If a split sample is desired, a cleaned, stainless steel knife should be used to divide the tube contents in half, longitudinally. This sampler is typically available in 2- and 3.5-inch diameter tubes. A larger barrel (diameter and/or length) may be necessary to obtain the required sample volume.

6. Without disturbing the core, transfer it to the appropriately labeled sample container(s) and seal tightly. Place the remainder of the sample into a stainless steel, plastic, or appropriate homogenization container, and mix thoroughly to obtain a sample that is representative of the entire sampling interval. Then, either place the sample into the appropriate, labeled containers and secure the caps tightly, or if composite samples are to be collected, place a sample from another sampling interval or location into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate, labeled containers and secure the caps tightly.

7. Abandon the hole according to applicable state regulations.

7.2.5 Test Pit/Trench Excavation

A backhoe can be used to remove sections of soil when a detailed examination of stratigraphy and soil characteristics is required. The following procedures are used for collecting soil samples from test pits or trenches:

1. Prior to any excavation with a backhoe, it is imperative to ensure that all sampling locations are clear of overhead and buried utilities.

2. Review the site specific HASP and ensure that all safety precautions including appropriate monitoring equipment are installed as required.

3. Using the backhoe, excavate a trench approximately three feet wide and approximately one foot deep below the cleared sampling location. Place excavated soils on plastic sheets. Trenches greater than five feet deep must be sloped or protected by a shoring system, as required by Occupational Safety and Health Administration (OSHA) regulations.

4. A shovel is used to remove a one to two inch layer of soil from the vertical face of the pit where sampling is to be done.

5. Samples are taken using a trowel, scoop, or coring device at the desired intervals. Be sure to scrape the vertical face at the point of sampling to remove any soil that may have fallen from above, and to expose fresh soil for sampling. In many instances, samples can be collected directly from the backhoe bucket.

6. If VOC analyses are required, transfer the sample into an appropriate, labeled sample container with a stainless steel spoon, or equivalent and secure the cap tightly. Place the remainder of the sample into a stainless steel, plastic, or other appropriate homogenization container, and mix thoroughly to obtain a sample representative of the entire sampling interval. Then, either place the sample into appropriate, labeled containers and secure the caps tightly; or, if composite samples are to be collected, place a sample from another sampling interval into the homogenization container and mix thoroughly. When compositing is complete, place the sample into the appropriate, labeled containers and secure the caps tightly.

7. Abandon the pit or excavation according to applicable state regulations.

7.2.6 Sampling for VOCs in Soil Using an En Core® Sampler

An En Core® sampler is a single-use device designed to collect and transport samples to the laboratory. The En Core® sampler is made of an inert composite polymer and reduces the open-air handling of soil samples in the field and in the laboratory; thereby, minimizing losses of VOCs.

1. Assemble the coring body, plunger rod and T-handle according to the instructions provided with the En Core® sampler.

2. Turn the T-handle with the T-up and the coring body down and push the sampler into the soil until the coring body is completely full. Remove the sampler from the soil. Wipe excess soil from the coring body exterior.

3. Cap the coring body while it is still on the T-handle. Push the cap over the flat area of the ridge. Be sure that the cap is seated properly to seal the sampler. Push and cap to lock arm in place.

4. Remove the capped sampler by depressing the locking lever on the T-handle while twisting and pulling the sampler from the T-handle.

5. Attach the label to the coring body cap, place in a plastic zippered bag, seal and put on ice.

Generally, three En Core® samplers are required for each sample location. These samplers are shipped to the laboratory where the cap is removed and the soil samples are preserved with methanol or sodium bisulfate.

8.0 CALCULATIONS

This section is not applicable to this SOP.

9.0 QUALITY ASSURANCE/QUALITY CONTROL

There are no specific quality assurance (QA) activities that apply to the implementation of these procedures. However, the following general QA procedures apply:

2. All data must be documented in site logbooks or on field data sheets. At a minimum, the following data is recorded:

Sampler's name and affiliation with project
Sample number
Sample location
Sample depth
Approximate volume of sample collected
Type of analyses to be performed
Sample description
Date and time of sample collection
Weather conditions at time of sampling
Method of sample collection
Sketch of sample location

2. All instrumentation must be operated in accordance with applicable SOPs and/or the manufacturer's operating instructions, unless otherwise specified in the work plan. Equipment checkout and calibration activities must occur prior to sampling/operation, and must be documented.

3. The types of quality control (QC) samples to be collected in the field shall be documented in the site-specific Work Plan.

10.0 DATA VALIDATION

This section is not applicable to this SOP.

11.0 HEALTH AND SAFETY

When working with potentially hazardous materials, follow U.S. EPA, OSHA and corporate health and safety procedures, in addition to the procedures specified in the site specific HASP.

12.0 REFERENCES

Mason, B.J. 1983. *Preparation of Soil Sampling Protocol: Technique and Strategies*. EPA-600/4-83-020.

Barth, D.S. and B.J. Mason. 1989. *Soil Sampling Quality Assurance User's Guide*. EPA-600/8-89-046.

U.S. Environmental Protection Agency. 1984. *Characterization of Hazardous Waste Sites - A Methods Manual: Volume II.* Available Sampling Methods, Second Edition. EPA-600/4-84-076.

de Vera, ER, B.P. Simmons, R.D. Stephen, and D.L. Storm. 1980. *Samplers and Sampling Procedures for Hazardous Waste Streams*. EPA-600/2-80-018.

American Society for Testing and Materials. *Standard Test Method for Penetration Test and Split-Barrel Sampling of Soils*. Method D 1586-99.

En Novative Technologies, Inc. 2001. *En Core® Sampler Sampling Procedures*. Web site access. March 13, 2001.

APPENDIX A
Figures
SOP #2012
July 2001

FIGURE 1. Sampling Augers

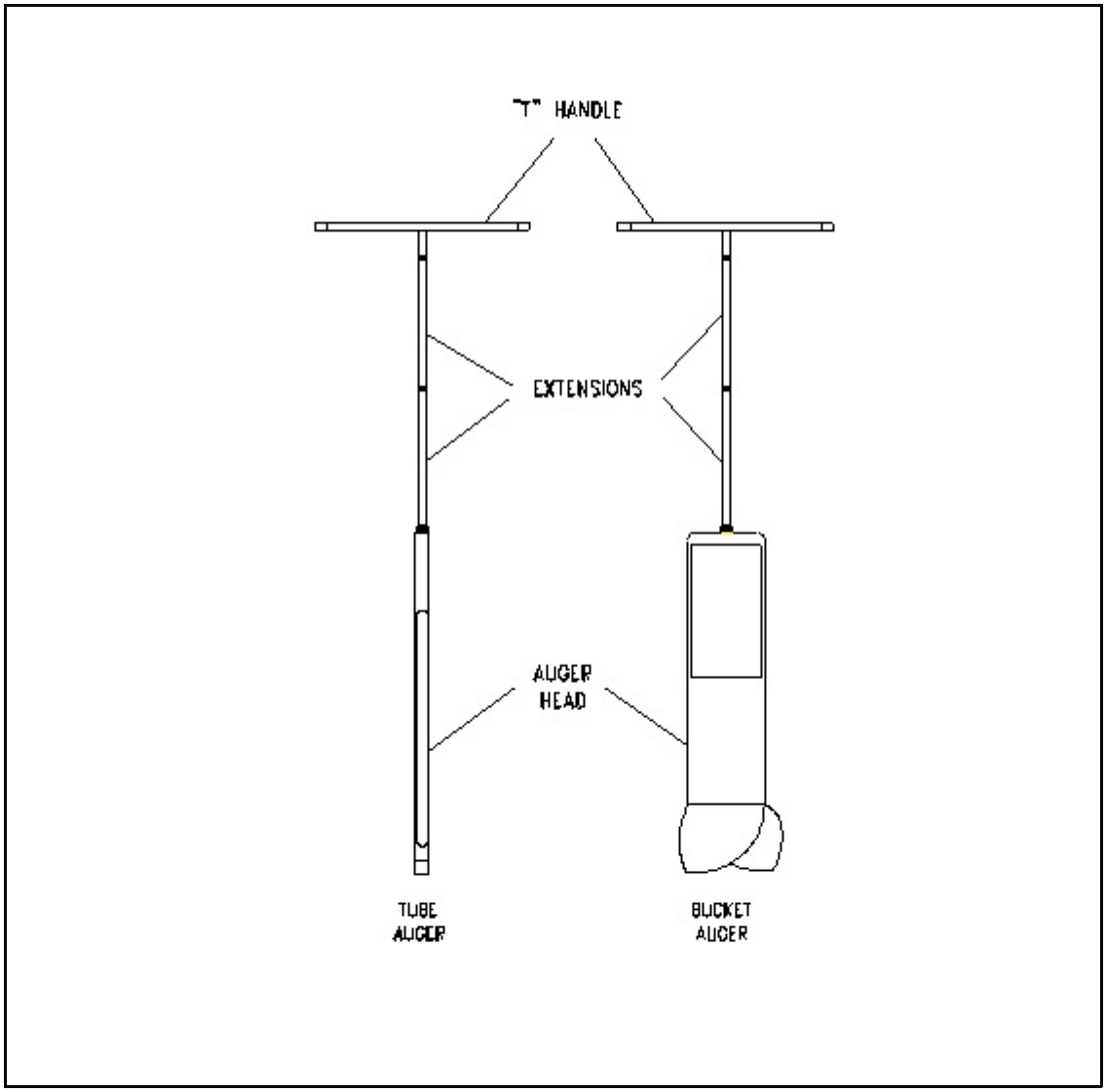
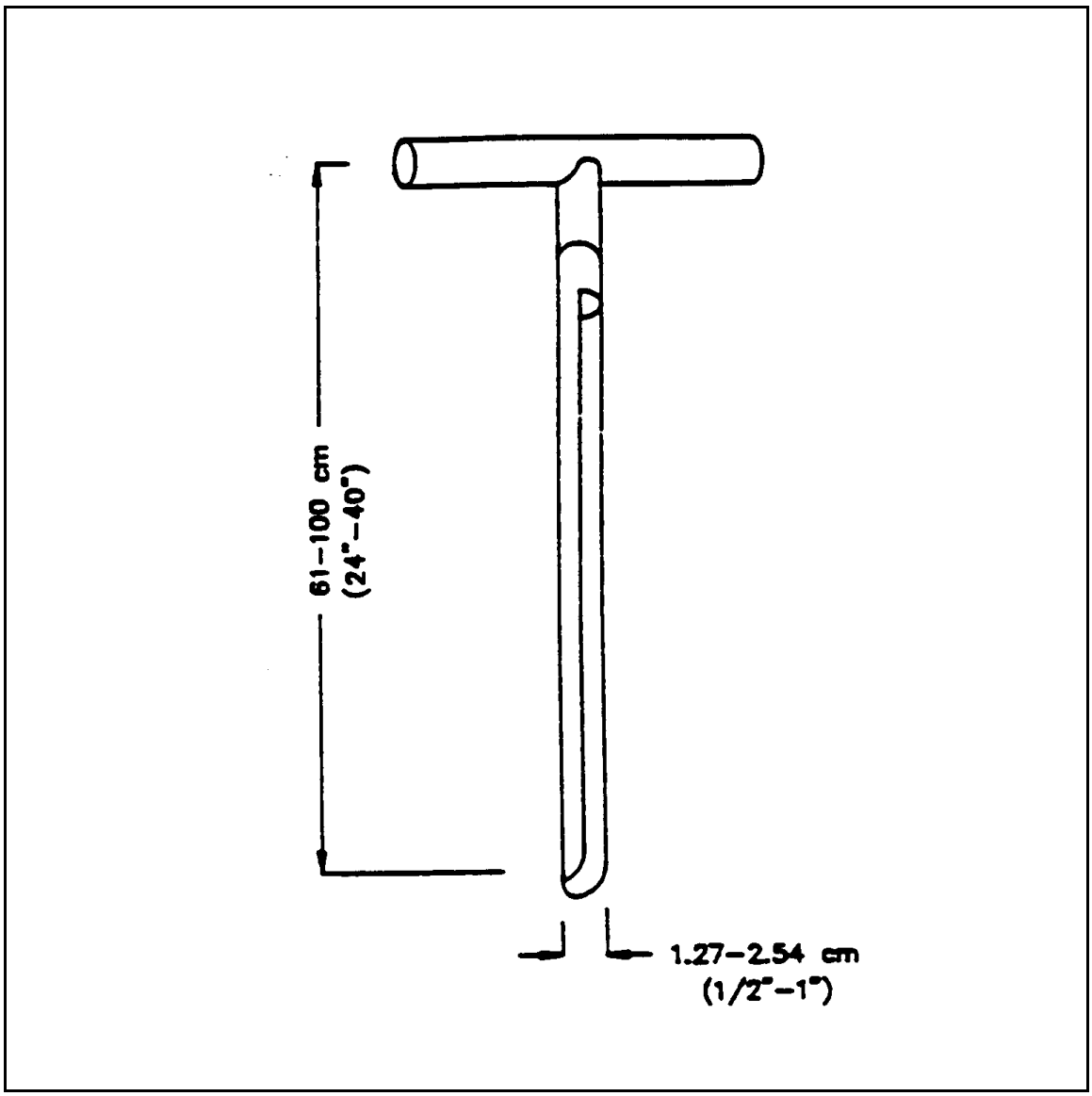
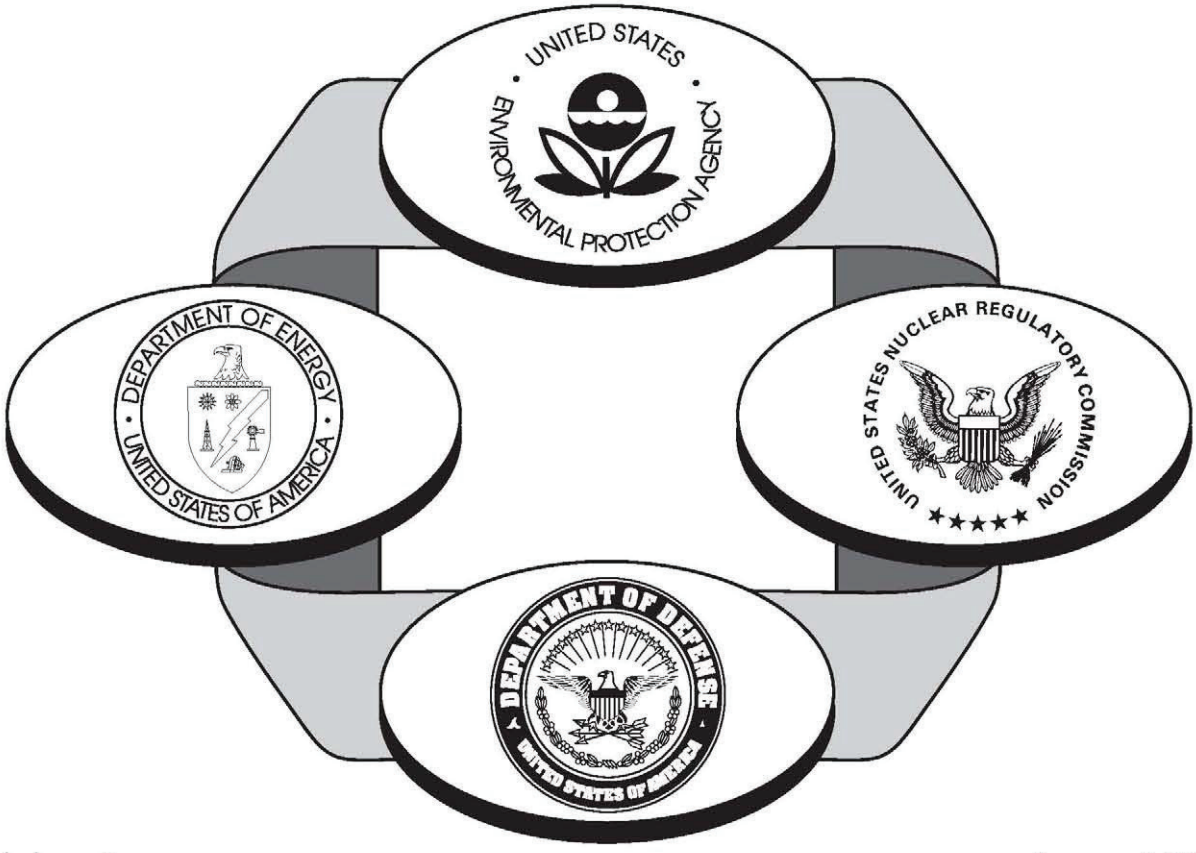


FIGURE 2. Sampling Trier


61-100 cm
(24"-40")
1.27-2.54 cm
(1/2"-1")

NUREG-1575, Rev. 1
EPA 402-R-97-016, Rev. 1
DOE/EH-0624, Rev. 1

MULTI-AGENCY RADIATION SURVEY AND SITE INVESTIGATION MANUAL (MARSSIM)



Revision 1

August 2000

ATTACHMENT C

Action Levels

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information																Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				1.2E-03	O						1.36E+09		1	0.1	Acephate	30560-19-1					9.4E+01	4.0E+02		7.6E+01
		2.2E-06	I			9.0E-03	I	V		1.1E+05	1.36E+09	8.7E+03	1		Acetaldehyde	75-07-0			1.1E+03	1.1E+03			8.2E+01	8.2E+01
				2.0E-02	I						1.36E+09		1	0.1	Acetochlor	34256-82-1					1.6E+03	6.6E+03		1.3E+03
				9.0E-01	I	3.1E+01	A	V		1.1E+05	1.36E+09	1.4E+04	1		Acetone	67-64-1					7.0E+04		4.4E+05	6.1E+04
						2.0E-03	X				1.36E+09		1	0.1	Acetone Cyanohydrin	75-86-5							2.8E+06	2.8E+06
						6.0E-02	I	V		1.3E+05	1.36E+09	1.3E+04	1		Acetonitrile	75-05-8							8.1E+02	8.1E+02
				1.0E-01	I			V		2.5E+03	1.36E+09	6.0E+04	1		Acetophenone	98-86-2					7.8E+03			7.8E+03
3.8E+00	C	1.3E-03	C								1.36E+09		1	0.1	Acetylaminofluorene, 2-	53-96-3	1.8E+01	6.5E+01	2.9E+05	1.4E+01				
				5.0E-04	I	2.0E-05	I	V		2.3E+04	1.36E+09	6.9E+03	1		Acrolein	107-02-8					3.9E+01		1.4E-01	1.4E-01
5.0E-01	I	1.0E-04	I	2.0E-03	I	6.0E-03	I		M		1.36E+09		1	0.1	Acrylamide	79-06-1	3.1E+01	1.2E+02	1.4E+06	2.4E+01	1.6E+02	6.6E+02	8.5E+06	1.3E+02
				5.0E-01	I	1.0E-03	I	V		1.1E+05	1.36E+09	9.5E+04	1		Acrylic Acid	79-10-7					3.9E+04		9.9E+01	9.9E+01
5.4E-01	I	6.8E-05	I	4.0E-02	A	2.0E-03	I	V		1.1E+04	1.36E+09	7.7E+03	1		Acrylonitrile	107-13-1	1.3E+02		3.2E+01	2.5E+01	3.1E+03		1.6E+01	1.6E+01
						6.0E-03	P				1.36E+09		1	0.1	Adiponitrile	111-69-3							8.5E+06	8.5E+06
5.6E-02	C			1.0E-02	I						1.36E+09		1	0.1	Alachlor	15972-60-8	1.2E+03	4.4E+03		9.7E+02	7.8E+02	3.3E+03		6.3E+02
				1.0E-03	I						1.36E+09		1	0.1	Aldicarb	116-06-3					7.8E+01	3.3E+02		6.3E+01
				1.0E-03	I						1.36E+09		1	0.1	Aldicarb Sulfone	1646-88-4					7.8E+01	3.3E+02		6.3E+01
											1.36E+09		1	0.1	Aldicarb sulfoxide	1646-87-3								
1.7E+01	I	4.9E-03	I	3.0E-05	I			V			1.36E+09	1.7E+06	1		Aldrin	309-00-2	4.1E+00		9.8E+01	3.9E+00	2.3E+00			2.3E+00
				5.0E-03	I	1.0E-04	X	V		1.1E+05	1.36E+09	3.4E+04	1		Allyl Alcohol	107-18-6					3.9E+02		3.6E+00	3.5E+00
2.1E-02	C	6.0E-06	C			1.0E-03	I	V		1.4E+03	1.36E+09	1.6E+03	1		Allyl Chloride	107-05-1	3.3E+03		7.4E+01	7.2E+01			1.7E+00	1.7E+00
				1.0E+00	P	5.0E-03	P				1.36E+09		1		Aluminum	7429-90-5					7.8E+04		7.1E+06	7.7E+04
				4.0E-04	I						1.36E+09		1		Aluminum Phosphide	20859-73-8					3.1E+01			3.1E+01
				9.0E-03	I						1.36E+09		1	0.1	Ametryn	834-12-8					7.0E+02	3.0E+03		5.7E+02
2.1E+01	C	6.0E-03	C								1.36E+09		1	0.1	Aminobiphenyl, 4-	92-67-1	3.3E+00	1.2E+01	6.4E+04	2.6E+00				
				8.0E-02	P						1.36E+09		1	0.1	Aminophenol, m-	591-27-5					6.3E+03	2.6E+04		5.1E+03
				4.0E-03	X						1.36E+09		1	0.1	Aminophenol, o-	95-55-6					3.1E+02	1.3E+03		2.5E+02
				2.0E-02	P						1.36E+09		1	0.1	Aminophenol, p-	123-30-8					1.6E+03	6.6E+03		1.3E+03
				2.5E-03	I						1.36E+09		1	0.1	Amitraz	33089-61-1					2.0E+02	8.2E+02		1.6E+02
						5.0E-01	I	V					1		Ammonia	7664-41-7								
				2.0E-01	I						1.36E+09		1		Ammonium Sulfamate	7773-06-0					1.6E+04			1.6E+04
						3.0E-03	X	V		1.4E+04	1.36E+09	2.6E+04	1		Amyl Alcohol, tert-	75-85-4							8.2E+01	8.2E+01
5.7E-03	I	1.6E-06	C	7.0E-03	P	1.0E-03	I				1.36E+09		1	0.1	Aniline	62-53-3	1.2E+04	4.3E+04	2.4E+08	9.5E+03	5.5E+02	2.3E+03	1.4E+06	4.4E+02
4.0E-02	P			2.0E-03	X						1.36E+09		1	0.1	Anthraquinone, 9,10-	84-65-1	1.7E+03	6.2E+03		1.4E+03	1.6E+02	6.6E+02		1.3E+02
				4.0E-04	I	3.0E-04	A				1.36E+09			0.15	Antimony (metallic)	7440-36-0					3.1E+01		4.3E+05	3.1E+01
				5.0E-04	H						1.36E+09			0.15	Antimony Pentoxide	1314-60-9					3.9E+01			3.9E+01
				4.0E-04	H						1.36E+09			0.15	Antimony Tetroxide	1332-81-6					3.1E+01			3.1E+01
						2.0E-04	I				1.36E+09			0.15	Antimony Trioxide	1309-64-4							2.8E+05	2.8E+05
1.5E+00	I	4.3E-03	I	3.0E-04	I	1.5E-05	C				1.36E+09		1	0.03	Arsenic, Inorganic	7440-38-2	7.7E+01	5.5E+02	8.9E+04	6.8E+01	3.9E+01	3.3E+02	2.1E+04	3.5E+01
				3.5E-06	C	5.0E-05	I				1.36E+09		1		Arsine	7784-42-1					2.7E-01		7.1E+04	2.7E-01
													1		Asbestos (units in fibers)	1332-21-4								
				3.6E-02	O						1.36E+09		1	0.1	Asulam	3337-71-1					2.8E+03	1.2E+04		2.3E+03
2.3E-01	C			3.5E-02	I						1.36E+09		1	0.1	Atrazine	1912-24-9	3.0E+02	1.1E+03		2.4E+02	2.7E+03	1.2E+04		2.2E+03
8.8E-01	C	2.5E-04	C								1.36E+09		1	0.1	Auramine	492-80-8	7.9E+01	2.8E+02	1.5E+06	6.2E+01				
				4.0E-04	I						1.36E+09		1	0.1	Avermectin B1	65195-55-3					3.1E+01	1.3E+02		2.5E+01
				3.0E-03	A	1.0E-02	A				1.36E+09		1	0.1	Azinphos-methyl	86-50-0					2.3E+02	9.9E+02	1.4E+07	1.9E+02
1.1E-01	I	3.1E-05	I					V			1.36E+09	5.2E+05	1		Azobenzene	103-33-3	6.3E+02		4.7E+03	5.6E+02				
				1.0E+00	P	7.0E-06	P				1.36E+09		1	0.1	Azodicarbonamide	123-77-3					7.8E+04	3.3E+05	9.9E+03	8.6E+03
				2.0E-01	I	5.0E-04	H				1.36E+09			0.07	Barium	7440-39-3					1.6E+04		7.1E+05	1.5E+04
				5.0E-03	O			V			1.36E+09	3.1E+05	1		Benfluralin	1861-40-1					3.9E+02			3.9E+02
				5.0E-02	I						1.36E+09		1	0.1	Benomyl	17804-35-2					3.9E+03	1.6E+04		3.2E+03
				2.0E-01	I						1.36E+09		1	0.1	Bensulfuron-methyl	83055-99-6					1.6E+04	6.6E+04		1.3E+04
				3.0E-02	I						1.36E+09		1	0.1	Bentazon	25057-89-0					2.3E+03	9.9E+03		1.9E+03
4.0E-03	P			1.0E-01	I			V		1.2E+03	1.36E+09	2.3E+04	1		Benzaldehyde	100-52-7	1.7E+04			1.7E+04	7.8E+03			7.8E+03
5.5E-02	I	7.8E-06	I	4.0E-03	I	3.0E-02	I	V		1.8E+03	1.36E+09	3.5E+03	1		Benzene	71-43-2	1.3E+03		1.3E+02	1.2E+02	3.1E+02		1.1E+02	8.2E+01
1.0E-01	X			3.0E-04	X						1.36E+09		1	0.1	Benzenediamine-2-methyl sulfate, 1,4-	6369-59-1	7.0E+02	2.5E+03		5.4E+02	2.3E+01	9.9E+01		1.9E+01
				1.0E-03	P			V		1.3E+03	1.36E+09	1.9E+04	1		Benzenethiol	108-98-5					7.8E+01			7.8E+01
2.3E+02	I	6.7E-02	I	3.0E-03	I				M		1.36E+09		1	0.1	Benzidine	92-87-5	6.7E-02	2.6E-01	2.1E+03	5.3E-02	2.3E+02	9.9E+02		1.9E+02
				4.0E+00	I						1.36E+09		1	0.1	Benzoic Acid	65-85-0					3.1E+05	1.3E+06		2.5E+05
1.3E+01	I							V		3.2E+02	1.36E+09	6.8E+04	1		Benzotrichloride	98-07-7	5.3E+00			5.3E+00				
				1.0E-01	P						1.36E+09		1	0.1	Benzyl Alcohol	100-51-6					7.8E+03	3.3E+04		6.3E+03
1.7E-01	I	4.9E-05	C	2.0E-03	P	1.0E-03	P	V		1.5E+03	1.36E+09	2.6E+04	1		Benzyl Chloride	100-44-7	4.1E+02		1.5E+02	1.1E+02	1.6E+02		2.7E+01	2.3E+01
		2.4E-03	I	2.0E-03	I	2.0E-05	I				1.36E+09			0.007	Beryllium and compounds	7440-41-7			1.6E+05	1.6E+05	1.6E+02		2.8E+04	1.6E+02
				9.0E-03	P						1.36E+09		1	0.1	Bifenox	42576-02-3					7.0E+02	3.0E+03		5.7E+02
				1.5E-02	I						1.36E+09		1	0.1	Biphenthrin	82657-04-3					1.2E+03	4.9E+03		9.5E+02
8.0E-03	I			5.0E-01	I	4.0E-04	X	V			1.36E+09	1.1E+05	1		Biphenyl, 1,1'-	92-52-4	8.7E+03			8.7E+03	3.9E+04		4.8E+01	4.7E+01
				4.0E-02	I			V		1.0E+03	1.36E+09	3.5E+04	1		Bis(2-chloro-1-methylethyl) ether	108-60-1					3.1E+03			3.1E+03
				3.0E-03	P						1.36E+09		1	0.1	Bis(2-chloroethoxy)methane	111-91-1					2.3E+02	9.9E+02		1.9E+02
1.1E+00	I	3.3E-04	I					V		5.1E+03	1.36E+09	4.3E+04	1		Bis(2-chloroethyl)ether	111-44-4	6.3E+01		3.6E+01	2.3E+01				
2.2E+02	I	6.2E-02	I					V		4.2E+03	1.36E+09	1.9E+03	1		Bis(chloromethyl)ether	542-88-1	3.2E-01		8.5E-03	8.3E-03				
				5.0E-02	I						1.36E+09		1	0.1	Bisphenol A	80-05-7					3.9E+03	1.6E+04		3.2E+03
				2.0E-01	I	2.0E-02	H				1.36E+09		1		Boron And Borates Only	7440-42-8					1.6E+04		2.8E+07	1.6E+04
				2.0E+00	P	2.0E-02	P	V			1.36E+09		1		Boron Trichloride	10294-34-5					1.6E+05		2.8E+07	1.6E+05
				4.0E-02	C	1.3E-02	C	V			1.36E+09		1		Boron Trifluoride	7637-07-2					3.1E+03		1.8E+07	3.1E+03
7.0E-01	I			4.0E-03	I						1.36E+09		1		Bromate	15541-45-4	9.9E+01			9.9E+01	3.1E+02			3.1E+02
2.0E+00	X	6.0E-04	X					V		2.4E+03	1.36E+09	5.9E+03	1		Bromo-2-chloroethane, 1-	107-04-0	3.5E+01		2.8E+00	2.6E+00				
				3.0E-04	X			V		9.0E+02	1.36E+09	1.1E+04	1		Bromo-3-fluorobenzene, 1-	1073-06-9					2.3E+01			2.3E+01
				3.0E-04	X			V		3.2E+02	1.36E+09	1.1E+04	1		Bromo-4-fluorobenzene, 1-	460-00-4					2.3E+01			2.3E+01
											1.36E+09		1	0.1	Bromoacetic acid	79-08-3								
				8.0E-03	I	6.0E-02	I	V		6.8E+02	1.36E+09	8.4E+03	1		Bromobenzene	108-86-1					6.3E+02		5.2E+02	2.9E+02

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
						4.0E-02	X	V		4.0E+03	1.36E+09	3.6E+03	1		Bromochloromethane	74-97-5							1.5E+02	1.5E+02
6.2E-02	I	3.7E-05	C	2.0E-02	I			V		9.3E+02	1.36E+09	4.0E+03	1		Bromodichloromethane	75-27-4	1.1E+03		3.0E+01	2.9E+01	1.6E+03			1.6E+03
7.9E-03	I	1.1E-06	I	2.0E-02	I			V		9.2E+02	1.36E+09	9.7E+03	1		Bromoform	75-25-2	8.8E+03		2.5E+03	1.9E+03	1.6E+03			1.6E+03
				1.4E-03	I	5.0E-03	I	V		3.6E+03	1.36E+09	1.4E+03	1		Bromomethane	74-83-9					1.1E+02		7.3E+00	6.8E+00
				5.0E-03	H			V			1.36E+09	1.2E+05	1		Bromophos	2104-96-3					3.9E+02			3.9E+02
						1.0E-01	A	V		9.7E+02	1.36E+09	2.1E+03	1		Bromopropane, 1-	106-94-5							2.2E+02	2.2E+02
1.0E-01	O			1.5E-02	O						1.36E+09		1	0.1	Bromoxynil	1689-84-5	6.7E+02	2.4E+03		5.3E+02	1.2E+03	4.9E+03		9.5E+02
1.0E-01	O			1.5E-02	O			V			1.36E+09	4.7E+05	1		Bromoxynil Octanoate	1689-99-2	6.7E+02			6.7E+02	1.2E+03			1.2E+03
6.0E-01	C	3.0E-05	I			2.0E-03	I	V		6.7E+02	1.36E+09	8.7E+02	1		Butadiene, 1,3-	106-99-0	1.2E+02		8.1E+00	7.6E+00			1.8E+00	1.8E+00
				3.0E-02	O						1.36E+09		1	0.1	Butanoic acid, 4-(2,4-dichlorophenoxy)-	94-82-6					2.3E+03	9.9E+03		1.9E+03
				1.0E-01	I			V		7.6E+03	1.36E+09	3.0E+04	1		Butanol, N-	71-36-3					7.8E+03			7.8E+03
				2.0E+00	P	3.0E+01	P	V		2.1E+04	1.36E+09	2.9E+04	1		Butyl alcohol, sec-	78-92-2					1.6E+05		9.1E+05	1.3E+05
				5.0E-02	I			V			1.36E+09	8.6E+04	1		Butylate	2008-41-5					3.9E+03			3.9E+03
2.0E-04	C	5.7E-08	C								1.36E+09		1	0.1	Butylated hydroxyanisole	25013-16-5	3.5E+05	1.2E+06	6.7E+09	2.7E+05				
3.6E-03	P			3.0E-01	P						1.36E+09		1	0.1	Butylated hydroxytoluene	128-37-0	1.9E+04	6.9E+04		1.5E+04	2.3E+04	9.9E+04		1.9E+04
				5.0E-02	P			V		1.1E+02	1.36E+09	8.1E+03	1		Butylbenzene, n-	104-51-8					3.9E+03			3.9E+03
				1.0E-01	X			V		1.5E+02	1.36E+09	7.4E+03	1		Butylbenzene, sec-	135-98-8					7.8E+03			7.8E+03
				1.0E-01	X			V		1.8E+02	1.36E+09	7.4E+03	1		Butylbenzene, tert-	98-06-6					7.8E+03			7.8E+03
				2.0E-02	A						1.36E+09		1	0.1	Cacodylic Acid	75-60-5					1.6E+03	6.6E+03		1.3E+03
		1.8E-03	I	1.0E-03	I	1.0E-05	A				1.36E+09		0.025	0.001	Cadmium (Diet)	7440-43-9			2.1E+05	2.1E+05	7.8E+01	8.2E+02	1.4E+04	7.1E+01
		1.8E-03	I	5.0E-04	I	1.0E-05	A						0.05	0.001	Cadmium (Water)	7440-43-9								
				5.0E-01	I	2.2E-03	C				1.36E+09		1	0.1	Caprolactam	105-60-2					3.9E+04	1.6E+05	3.1E+06	3.1E+04
1.5E-01	C	4.3E-05	C	2.0E-03	I						1.36E+09		1	0.1	Captafol	2425-06-1	4.6E+02	1.6E+03	8.9E+06	3.6E+02	1.6E+02	6.6E+02		1.3E+02
2.3E-03	C	6.6E-07	C	1.3E-01	I						1.36E+09		1	0.1	Captan	133-06-2	3.0E+04	1.1E+05	5.8E+08	2.4E+04	1.0E+04	4.3E+04		8.2E+03
				1.0E-01	I						1.36E+09		1	0.1	Carbaryl	63-25-2					7.8E+03	3.3E+04		6.3E+03
				5.0E-03	I						1.36E+09		1	0.1	Carbofuran	1563-66-2					3.9E+02	1.6E+03		3.2E+02
				1.0E-01	I	7.0E-01	I	V		7.4E+02	1.36E+09	1.2E+03	1		Carbon Disulfide	75-15-0					7.8E+03		8.5E+02	7.7E+02
7.0E-02	I	6.0E-06	I	4.0E-03	I	1.0E-01	I	V		4.6E+02	1.36E+09	1.5E+03	1		Carbon Tetrachloride	56-23-5	9.9E+02		7.0E+01	6.5E+01	3.1E+02		1.6E+02	1.0E+02
						1.0E-01	P	V		5.9E+03	1.36E+09	6.5E+02	1		Carbonyl Sulfide	463-58-1							6.7E+01	6.7E+01
				1.0E-02	I						1.36E+09		1	0.1	Carbosulfan	55285-14-8					7.8E+02	3.3E+03		6.3E+02
				1.0E-01	I						1.36E+09		1	0.1	Carboxin	5234-68-4					7.8E+03	3.3E+04		6.3E+03
						9.0E-04	I				1.36E+09		1		Ceric oxide	1306-38-3							1.3E+06	1.3E+06
				1.0E-01	I			V			1.36E+09	1.5E+05	1		Chloral Hydrate	302-17-0					7.8E+03			7.8E+03
				1.5E-02	I						1.36E+09		1	0.1	Chloramben	133-90-4					1.2E+03	4.9E+03		9.5E+02
											1.36E+09				Chloramines, Organic	E701235								
4.0E-01	H										1.36E+09		1	0.1	Chloranil	118-75-2	1.7E+02	6.1E+02		1.3E+02				
3.5E-01	I	1.0E-04	I	5.0E-04	I	7.0E-04	I	V			1.36E+09	1.5E+06	1	0.04	Chlordane (technical mixture)	12789-03-6	2.0E+02	1.8E+03	4.3E+03	1.7E+02	3.9E+01	4.1E+02	1.1E+03	3.5E+01
1.0E+01	I	4.6E-03	C	3.0E-04	I						1.36E+09		1	0.1	Chlordecone (Kepone)	143-50-0	7.0E+00	2.5E+01	8.3E+04	5.4E+00	2.3E+01	9.9E+01		1.9E+01
				7.0E-04	A						1.36E+09		1	0.1	Chlorfenvinphos	470-90-6					5.5E+01	2.3E+02		4.4E+01
				9.0E-02	O						1.36E+09		1	0.1	Chlorimuron, Ethyl-	90982-32-4					7.0E+03	3.0E+04		5.7E+03
				1.0E-01	I	1.5E-04	A	V		2.8E+03	1.36E+09	1.2E+03	1		Chlorine	7782-50-5					7.8E+03		1.8E-01	1.8E-01
				3.0E-02	I	2.0E-04	I	V			1.36E+09		1		Chlorine Dioxide	10049-04-4					2.3E+03		2.8E+05	2.3E+03
				3.0E-02	I						1.36E+09		1		Chlorite (Sodium Salt)	7758-19-2					2.3E+03			2.3E+03
						5.0E+01	I	V		1.2E+03	1.36E+09	1.0E+03	1		Chloro-1,1-difluoroethane, 1-	75-68-3							5.4E+04	5.4E+04
		3.0E-04	I	2.0E-02	H	2.0E-02	I	V		7.9E+02	1.36E+09	1.1E+03	1		Chloro-1,3-butadiene, 2-	126-99-8			1.0E+00	1.0E+00	1.6E+03		2.2E+01	2.2E+01
4.6E-01	H										1.36E+09		1	0.1	Chloro-2-methylaniline HCl, 4-	3165-93-3	1.5E+02	5.4E+02		1.2E+02				
1.0E-01	P	7.7E-05	C	3.0E-03	X						1.36E+09		1	0.1	Chloro-2-methylaniline, 4-	95-69-2	7.0E+02	2.5E+03	5.0E+06	5.4E+02	2.3E+02	9.9E+02		1.9E+02
2.7E-01	X							V		1.2E+04	1.36E+09	1.6E+04	1		Chloroacetaldehyde, 2-	107-20-0	2.6E+02			2.6E+02				
											1.36E+09		1	0.1	Chloroacetic Acid	79-11-8								
						3.0E-05	I				1.36E+09		1	0.1	Chloroacetophenone, 2-	532-27-4							4.3E+04	4.3E+04
2.0E-01	P			4.0E-03	I						1.36E+09		1	0.1	Chloroaniline, p-	106-47-8	3.5E+02	1.2E+03		2.7E+02	3.1E+02	1.3E+03		2.5E+02
				2.0E-02	I	5.0E-02	P	V		7.6E+02	1.36E+09	6.5E+03	1		Chlorobenzene	108-90-7					1.6E+03		3.4E+02	2.8E+02
				1.0E-01	X						1.36E+09		1	0.1	Chlorobenzene sulfonic acid, p-	98-66-8					7.8E+03	3.3E+04		6.3E+03
1.1E-01	C	3.1E-05	C	2.0E-02	I						1.36E+09		1	0.1	Chlorobenzilate	510-15-6	6.3E+02	2.2E+03	1.2E+07	4.9E+02	1.6E+03	6.6E+03		1.3E+03
				3.0E-02	X						1.36E+09		1	0.1	Chlorobenzoic Acid, p-	74-11-3					2.3E+03	9.9E+03		1.9E+03
				3.0E-03	P	3.0E-01	P	V		2.9E+02	1.36E+09	6.8E+03	1		Chlorobenzotrifluoride, 4-	98-56-6					2.3E+02		2.1E+03	2.1E+02
				4.0E-02	P			V		7.3E+02	1.36E+09	1.8E+03	1		Chlorobutane, 1-	109-69-3					3.1E+03			3.1E+03
						5.0E+01	I	V		1.7E+03	1.36E+09	9.4E+02	1		Chlorodifluoromethane	75-45-6							4.9E+04	4.9E+04
				2.0E-02	P			V		1.1E+05	1.36E+09	7.8E+04	1		Chloroethanol, 2-	107-07-3					1.6E+03			1.6E+03
3.1E-02	C	2.3E-05	I	1.0E-02	I	9.8E-02	A	V		2.5E+03	1.36E+09	2.6E+03	1		Chloroform	67-66-3	2.2E+03		3.2E+01	3.2E+01	7.8E+02		2.7E+02	2.0E+02
						9.0E-02	I	V		1.3E+03	1.36E+09	1.2E+03	1		Chloromethane	74-87-3							1.1E+02	1.1E+02
2.4E+00	C	6.9E-04	C					V		9.3E+03	1.36E+09	5.3E+03	1		Chloromethyl Methyl Ether	107-30-2	2.9E+01		2.2E+00	2.0E+00				
3.0E-01	P			3.0E-03	P	1.0E-05	X				1.36E+09		1	0.1	Chloronitrobenzene, o-	88-73-3	2.3E+02	8.2E+02		1.8E+02	2.3E+02	9.9E+02	1.4E+04	1.9E+02
6.0E-02	P			7.0E-04	P	2.0E-03	P				1.36E+09		1	0.1	Chloronitrobenzene, p-	100-00-5	1.2E+03	4.1E+03		9.0E+02	5.5E+01	2.3E+02	2.8E+06	4.4E+01
				5.0E-03	I			V		2.7E+04	1.36E+09	1.4E+05	1		Chlorophenol, 2-	95-57-8					3.9E+02			3.9E+02
						4.0E-04	C	V		6.2E+02	1.36E+09	4.7E+03	1		Chloropicrin	76-06-2							2.0E+00	2.0E+00
1.7E-02	C			1.5E-02	I						1.36E+09		1	0.1	Chlorothalonil	1897-45-6	4.1E+03	1.5E+04		3.2E+03	1.2E+03	4.9E+03		9.5E+02
				2.0E-02	I			V		9.1E+02	1.36E+09	8.1E+03	1		Chlorotoluene, o-	95-49-8					1.6E+03			1.6E+03
				2.0E-02	X			V		2.5E+02	1.36E+09	7.3E+03	1		Chlorotoluene, p-	106-43-4					1.6E+03			1.6E+03
2.4E+02	C	6.9E-02	C								1.36E+09		1	0.1	Chlorozotocin	54749-90-5	2.9E-01	1.0E+00	5.5E+03	2.3E-01				
				5.0E-02	O						1.36E+09		1	0.1	Chlorpropham	101-21-3					3.9E+03	1.6E+04		3.2E+03
				1.0E-03	A						1.36E+09		1	0.1	Chlorpyrifos	2921-88-2					7.8E+01	3.3E+02		6.3E+01
				1.0E-02	H						1.36E+09		1	0.1	Chlorpyrifos Methyl	5598-13-0					7.8E+02	3.3E+03		6.3E+02
				5.0E-02	O						1.36E+09		1	0.1	Chlorsulfuron	64902-72-3					3.9E+03	1.6E+04		3.2E+03
				1.0E-02	I						1.36E+09		1	0.1	Chlorthal-dimethyl	1861-32-1					7.8E+02	3.3E+03		6.3E+02
				8.0E-04	H						1.36E+09		1	0.1	Chlorthiophos	60238-56-4					6.3E+01	2.6E+02		5.1E+01
				1.5E+00	I						1.36E+09		0.013		Chromium(III), Insoluble Salts	16065-83-1					1.2E+05			1.2E+05
5.0E-01	C	8.4E-02	G	3.0E-03	I	1.0E-04	I		M		1.36E+09		0.025		Chromium(VI)	18540-29-9	3.1E+01		1.6E+03	3.0E+01	2.3E+02		1.4E+05	2.3E+02
											1.36E+09		0.013		Chromium, Total	7440-47-3								

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				1.3E-02	I						1.36E+09		1	0.1	Clofentezine	74115-24-5					1.0E+03	4.3E+03		8.2E+02
		9.0E-03	P	3.0E-04	P	6.0E-06	P				1.36E+09		1		Cobalt	7440-48-4			4.2E+04	4.2E+04	2.3E+01		8.5E+03	2.3E+01
		6.2E-04	I					V	M				1		Coke Oven Emissions	E649830								
				4.0E-02	H						1.36E+09		1		Copper	7440-50-8					3.1E+03			3.1E+03
				5.0E-02	I	6.0E-01	C				1.36E+09		1	0.1	Cresol, m-	108-39-4					3.9E+03	1.6E+04	8.5E+08	3.2E+03
				5.0E-02	I	6.0E-01	C				1.36E+09		1	0.1	Cresol, o-	95-48-7					3.9E+03	1.6E+04	8.5E+08	3.2E+03
				1.0E-01	A	6.0E-01	C				1.36E+09		1	0.1	Cresol, p-	106-44-5					7.8E+03	3.3E+04	8.5E+08	6.3E+03
				1.0E-01	A						1.36E+09		1	0.1	Cresol, p-chloro-m-	59-50-7					7.8E+03	3.3E+04		6.3E+03
				1.0E-01	A	6.0E-01	C				1.36E+09		1	0.1	Cresols	1319-77-3					7.8E+03	3.3E+04	8.5E+08	6.3E+03
1.9E+00	H			1.0E-03	P			V		1.7E+04	1.36E+09	1.9E+04	1		Crotonaldehyde, trans-	123-73-9	3.7E+01			3.7E+01	7.8E+01			7.8E+01
				1.0E-01	I	4.0E-01	I	V		2.7E+02	1.36E+09	6.2E+03	1		Cumene	98-82-8					7.8E+03		2.6E+03	1.9E+03
2.2E-01	C	6.3E-05	C								1.36E+09		1	0.1	Cupferron	135-20-6	3.2E+02	1.1E+03	6.1E+06	2.5E+02				
8.4E-01	H			2.0E-03	H						1.36E+09		1	0.1	Cyanazine	21725-46-2	8.3E+01	2.9E+02		6.5E+01	1.6E+02	6.6E+02		1.3E+02
															Cyanides									
				1.0E-03	I						1.36E+09		1		~Calcium Cyanide	592-01-8					7.8E+01			7.8E+01
				5.0E-03	I						1.36E+09		1		~Copper Cyanide	544-92-3					3.9E+02			3.9E+02
				6.0E-04	I	8.0E-04	G	V		9.5E+05	1.36E+09	5.3E+04	1		~Cyanide (CN-)	57-12-5					4.7E+01		4.4E+01	2.3E+01
				1.0E-03	I			V			1.36E+09		1		~Cyanogen	460-19-5					7.8E+01			7.8E+01
				9.0E-02	I			V			1.36E+09		1		~Cyanogen Bromide	506-68-3					7.0E+03			7.0E+03
				5.0E-02	I			V			1.36E+09		1		~Cyanogen Chloride	506-77-4					3.9E+03			3.9E+03
				6.0E-04	I	8.0E-04	I	V		1.0E+07	1.36E+09	5.2E+04	1		~Hydrogen Cyanide	74-90-8					4.7E+01		4.4E+01	2.3E+01
				2.0E-03	I						1.36E+09		1		~Potassium Cyanide	151-50-8					1.6E+02			1.6E+02
				5.0E-03	I						1.36E+09		0.04		~Potassium Silver Cyanide	506-61-6					3.9E+02			3.9E+02
				1.0E-01	I						1.36E+09		0.04		~Silver Cyanide	506-64-9					7.8E+03			7.8E+03
				1.0E-03	I						1.36E+09		1		~Sodium Cyanide	143-33-9					7.8E+01			7.8E+01
				2.0E-04	P						1.36E+09		1		~Thiocyanates	E1790664					1.6E+01			1.6E+01
				2.0E-04	X			V			1.36E+09		1		~Thiocyanic Acid	463-56-9					1.6E+01			1.6E+01
				5.0E-02	I						1.36E+09		1		~Zinc Cyanide	557-21-1					3.9E+03			3.9E+03
						6.0E+00	I	V		1.2E+02	1.36E+09	1.0E+03	1		Cyclohexane	110-82-7							6.5E+03	6.5E+03
2.0E-02	X			2.0E-02	X						1.36E+09		1	0.1	Cyclohexane, 1,2,3,4,5-pentabromo-6-chloro-	87-84-3	3.5E+03	1.2E+04		2.7E+03	1.6E+03	6.6E+03		1.3E+03
				5.0E+00	I	7.0E-01	P	V		5.1E+03	1.36E+09	4.2E+04	1		Cyclohexanone	108-94-1					3.9E+05		3.0E+04	2.8E+04
				5.0E-03	P	1.0E+00	X	V		2.8E+02	1.36E+09	1.5E+03	1		Cyclohexene	110-83-8					3.9E+02		1.5E+03	3.1E+02
				2.0E-01	I			V		2.9E+05	1.36E+09	7.5E+04	1		Cyclohexylamine	108-91-8					1.6E+04			1.6E+04
				2.5E-02	I						1.36E+09		1	0.1	Cyfluthrin	68359-37-5					2.0E+03	8.2E+03		1.6E+03
				1.0E-03	O						1.36E+09		1	0.1	Cyhalothrin	68085-85-8					7.8E+01	3.3E+02		6.3E+01
				5.0E-01	O						1.36E+09		1	0.1	Cyromazine	66215-27-8					3.9E+04	1.6E+05		3.2E+04
2.4E-01	I	6.9E-05	C	3.0E-05	X						1.36E+09		1	0.1	DDD, p,p'- (TDE)	72-54-8	2.9E+02	1.0E+03	5.5E+06	2.3E+02	2.3E+00	9.9E+00		1.9E+00
3.4E-01	I	9.7E-05	C	3.0E-04	X			V			1.36E+09	2.1E+06	1		DDE, p,p'-	72-55-9	2.0E+02		6.1E+03	2.0E+02	2.3E+01			2.3E+01
3.4E-01	I	9.7E-05	I	5.0E-04	I						1.36E+09		1	0.03	DDT	50-29-3	2.0E+02	2.4E+03	3.9E+06	1.9E+02	3.9E+01	5.5E+02		3.7E+01
				3.0E-02	I						1.36E+09		1	0.1	Dalapon	75-99-0					2.3E+03	9.9E+03		1.9E+03
1.8E-02	C	5.1E-06	C	1.5E-01	I						1.36E+09		1	0.1	Daminozide	1596-84-5	3.9E+03	1.4E+04	7.5E+07	3.0E+03	1.2E+04	4.9E+04		9.5E+03
7.0E-04	I			7.0E-03	I						1.36E+09		1	0.1	Decabromodiphenyl ether, 2,2',3,3',4,4',5,5',6,6'- (BDE-209)	1163-19-5	9.9E+04	3.5E+05		7.8E+04	5.5E+02	2.3E+03		4.4E+02
				4.0E-05	I						1.36E+09		1	0.1	Demeton	8065-48-3					3.1E+00	1.3E+01		2.5E+00
1.2E-03	I			6.0E-01	I						1.36E+09		1	0.1	Di(2-ethylhexyl)adipate	103-23-1	5.8E+04	2.1E+05		4.5E+04	4.7E+04	2.0E+05		3.8E+04
6.1E-02	H										1.36E+09		1	0.1	Diallate	2303-16-4	1.1E+03	4.1E+03		8.9E+02				
				7.0E-04	A						1.36E+09		1	0.1	Diazinon	333-41-5					5.5E+01	2.3E+02		4.4E+01
				1.0E-02	X			V			1.36E+09	5.2E+05	1		Dibenzothiophene	132-65-0					7.8E+02			7.8E+02
8.0E-01	P	6.0E-03	P	2.0E-04	P	2.0E-04	I	V	M	9.8E+02	1.36E+09	3.2E+04	1		Dibromo-3-chloropropane, 1,2-	96-12-8	1.9E+01		5.4E-01	5.3E-01	1.6E+01		6.7E+00	4.7E+00
											1.36E+09		1	0.1	Dibromoacetic acid	631-64-1								
				4.0E-04	X			V		1.6E+02	1.36E+09	1.9E+04	1		Dibromobenzene, 1,3-	108-36-1					3.1E+01			3.1E+01
				1.0E-02	I			V			1.36E+09	2.2E+04	1		Dibromobenzene, 1,4-	106-37-6					7.8E+02			7.8E+02
8.4E-02	I			2.0E-02	I			V		8.0E+02	1.36E+09	8.0E+03	1		Dibromochloromethane	124-48-1	8.3E+02			8.3E+02	1.6E+03			1.6E+03
2.0E+00	I	6.0E-04	I	9.0E-03	I	9.0E-03	I	V		1.3E+03	1.36E+09	8.6E+03	1		Dibromoethane, 1,2-	106-93-4	3.5E+01		4.0E+00	3.6E+00	7.0E+02		8.1E+01	7.3E+01
						4.0E-03	X	V		2.8E+03	1.36E+09	5.6E+03	1		Dibromomethane (Methylene Bromide)	74-95-3							2.4E+01	2.4E+01
				3.0E-04	P						1.36E+09		1	0.1	Dibutyltin Compounds	E1790660					2.3E+01	9.9E+01		1.9E+01
				3.0E-02	I						1.36E+09		1	0.1	Dicamba	1918-00-9					2.3E+03	9.9E+03		1.9E+03
											1.36E+09				Dichloramine	3400-09-7								
		4.2E-03	P					V		5.5E+02	1.36E+09	3.2E+03	1		Dichloro-2-butene, 1,4-	764-41-0			2.1E-01	2.1E-01				
		4.2E-03	P					V		5.2E+02	1.36E+09	1.1E+04	1		Dichloro-2-butene, cis-1,4-	1476-11-5			7.4E-01	7.4E-01				
		4.2E-03	P					V		7.6E+02	1.36E+09	1.1E+04	1		Dichloro-2-butene, trans-1,4-	110-57-6			7.4E-01	7.4E-01				
5.0E-02	I			4.0E-03	I						1.36E+09		1	0.1	Dichloroacetic Acid	79-43-6	1.4E+03	4.9E+03		1.1E+03	3.1E+02	1.3E+03		2.5E+02
				9.0E-02	I	2.0E-01	H	V		3.8E+02	1.36E+09	1.2E+04	1		Dichlorobenzene, 1,2-	95-50-1					7.0E+03		2.4E+03	1.8E+03
5.4E-03	C	1.1E-05	C	7.0E-02	A	8.0E-01	I	V			1.36E+09	1.0E+04	1		Dichlorobenzene, 1,4-	106-46-7	1.3E+04		2.7E+02	2.6E+02	5.5E+03		8.7E+03	3.4E+03
4.5E-01	I	3.4E-04	C								1.36E+09		1	0.1	Dichlorobenzidine, 3,3'-	91-94-1	1.5E+02	5.5E+02	1.1E+06	1.2E+02				
				9.0E-03	X						1.36E+09		1	0.1	Dichlorobenzophenone, 4,4'-	90-98-2					7.0E+02	3.0E+03		5.7E+02
				2.0E-01	I	1.0E-01	X	V		8.5E+02	1.36E+09	8.4E+02	1		Dichlorodifluoromethane	75-71-8					1.6E+04		8.8E+01	8.7E+01
5.7E-03	C	1.6E-06	C	2.0E-01	P			V		1.7E+03	1.36E+09	2.1E+03	1		Dichloroethane, 1,1-	75-34-3	1.2E+04		3.7E+02	3.6E+02	1.6E+04			1.6E+04
9.1E-02	I	2.6E-05	I	6.0E-03	X	7.0E-03	P	V		3.0E+03	1.36E+09	4.6E+03	1		Dichloroethane, 1,2-	107-06-2	7.6E+02		4.9E+01	4.6E+01	4.7E+02		3.3E+01	3.1E+01
				5.0E-02	I	2.0E-01	I	V		1.2E+03	1.36E+09	1.2E+03	1		Dichloroethylene, 1,1-	75-35-4					3.9E+03		2.4E+02	2.3E+02
				2.0E-03	I			V		2.4E+03	1.36E+09	2.5E+03	1		Dichloroethylene, 1,2-cis-	156-59-2					1.6E+02			1.6E+02
				2.0E-02	I			V		1.9E+03	1.36E+09	1.8E+03	1		Dichloroethylene, 1,2-trans-	156-60-5					1.6E+03			1.6E+03
				3.0E-03	I						1.36E+09		1	0.1	Dichlorophenol, 2,4-	120-83-2					2.3E+02	9.9E+02		1.9E+02
				1.0E-02	I						1.36E+09		1	0.05	Dichlorophenoxy Acetic Acid, 2,4-	94-75-7					7.8E+02	6.6E+03		7.0E+02
3.7E-02	P	3.7E-06	P	4.0E-02	P	4.0E-03	I	V		1.4E+03	1.36E+09	3.8E+03	1		Dichloropropane, 1,2-	78-87-5	1.9E+03		2.9E+02	2.5E+02	3.1E+03		1.6E+01	1.6E+01
				2.0E-02	P			V		1.5E+03	1.36E+09	6.8E+03	1		Dichloropropane, 1,3-	142-28-9					1.6E+03			1.6E+03
				3.0E-03	I						1.36E+09		1	0.1	Dichloropropanol, 2,3-	616-23-9					2.3E+02	9.9E+02		1.9E+02
1.0E-01	I	4.0E-06	I	3.0E-02	I	2.0E-02	I	V		1.6E+03	1.36E+09	3.6E+03	1		Dichloropropene, 1,3-	542-75-6	7.0E+02		2.5E+02	1.8E+02	2.3E+03		7.4E+01	7.2E+01
2.9E-01	I	8.3E-05	C	5.0E-04	I	5.0E-04	I				1.36E+09		1	0.1	Dichlorvos	62-73-7	2.4E+02	8.5E+02	4.6E+06	1.9E+02	3.9E+01	1.6E+02	7.1E+05	3.2E+01
				3.0E-05	O						1.36E+09		1	0.1	Dicrotophos	141-66-2					2.3E+00	9.9E+00		1.9E+00

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				8.0E-02	P	3.0E-04	X	V		2.6E+02	1.36E+09	4.1E+03	1		Dicyclopentadiene	77-73-6					6.3E+03		1.3E+00	1.3E+00
1.6E+01	I	4.6E-03	I	5.0E-05	I						1.36E+09		1	0.1	Dieldrin	60-57-1	4.3E+00	1.5E+01	8.3E+04	3.4E+00	3.9E+00	1.6E+01		3.2E+00
		3.0E-04	C			5.0E-03	I						1	0.1	Diesel Engine Exhaust	E17136615								
				2.0E-03	P	2.0E-04	P				1.36E+09		1	0.1	Diethanolamine	111-42-2					1.6E+02	6.6E+02	2.8E+05	1.3E+02
				3.0E-02	P	1.0E-04	P				1.36E+09		1	0.1	Diethylene Glycol Monobutyl Ether	112-34-5					2.3E+03	9.9E+03	1.4E+05	1.9E+03
				6.0E-02	P	3.0E-04	P				1.36E+09		1	0.1	Diethylene Glycol Monoethyl Ether	111-90-0					4.7E+03	2.0E+04	4.3E+05	3.8E+03
				1.0E-03	P			V		1.1E+05	1.36E+09	1.4E+05	1		Diethylformamide	617-84-5					7.8E+01			7.8E+01
3.5E+02	C	1.0E-01	C								1.36E+09		1	0.1	Diethylstilbestrol	56-53-1	2.0E-01	7.1E-01	3.8E+03	1.6E-01				
				8.3E-02	O						1.36E+09		1	0.1	Difenzoquat	43222-48-6					6.5E+03	2.7E+04		5.2E+03
				2.0E-02	I						1.36E+09		1	0.1	Diflubenzuron	35367-38-5					1.6E+03	6.6E+03		1.3E+03
						4.0E+01	I	V		1.4E+03	1.36E+09	1.2E+03	1		Difluoroethane, 1,1-	75-37-6							4.8E+04	4.8E+04
						3.0E+01	X	V		6.9E+02	1.36E+09	7.6E+02	1		Difluoropropane, 2,2-	420-45-1							2.4E+04	2.4E+04
4.4E-02	C	1.3E-05	C					V			1.36E+09	1.2E+05	1		Dihydrosafrole	94-58-6	1.6E+03		2.7E+03	9.9E+02				
						7.0E-01	P	V		2.3E+03	1.36E+09	3.1E+03	1		Diisopropyl Ether	108-20-3							2.2E+03	2.2E+03
				8.0E-02	I			V		5.3E+02	1.36E+09	3.8E+04	1		Diisopropyl Methylphosphonate	1445-75-6					6.3E+03			6.3E+03
				2.2E-02	O						1.36E+09		1	0.1	Dimethipin	55290-64-7					1.7E+03	7.2E+03		1.4E+03
				2.2E-03	O						1.36E+09		1	0.1	Dimethoate	60-51-5					1.7E+02	7.3E+02		1.4E+02
1.6E+00	P										1.36E+09		1	0.1	Dimethoxybenzidine, 3,3'-	119-90-4	4.3E+01	1.5E+02		3.4E+01				
1.7E-03	P			6.0E-02	P						1.36E+09		1	0.1	Dimethyl methylphosphonate	756-79-6	4.1E+04	1.5E+05		3.2E+04	4.7E+03	2.0E+04		3.8E+03
4.6E+00	C	1.3E-03	C								1.36E+09		1	0.1	Dimethylamino azobenzene [p-]	60-11-7	1.5E+01	5.4E+01	2.9E+05	1.2E+01				
5.8E-01	H										1.36E+09		1	0.1	Dimethylaniline HCl, 2,4-	21436-96-4	1.2E+02	4.3E+02		9.4E+01				
2.0E-01	P			2.0E-03	X						1.36E+09		1	0.1	Dimethylaniline, 2,4-	95-68-1	3.5E+02	1.2E+03		2.7E+02	1.6E+02	6.6E+02		1.3E+02
2.7E-02	P			2.0E-03	I			V		8.3E+02	1.36E+09	3.1E+04	1		Dimethylaniline, N,N-	121-69-7	2.6E+03			2.6E+03	1.6E+02			1.6E+02
1.1E+01	P										1.36E+09		1	0.1	Dimethylbenzidine, 3,3'-	119-93-7	6.3E+00	2.2E+01		4.9E+00				
				1.0E-01	P	3.0E-02	I	V		1.1E+05	1.36E+09	1.3E+05	1		Dimethylformamide	68-12-2					7.8E+03		4.0E+03	2.6E+03
				1.0E-04	X	2.0E-06	X	V		1.7E+05	1.36E+09	2.8E+04	1		Dimethylhydrazine, 1,1-	57-14-7					7.8E+00		5.8E-02	5.7E-02
5.5E+02	C	1.6E-01	C					V		1.9E+05	1.36E+09	1.7E+05	1		Dimethylhydrazine, 1,2-	540-73-8	1.3E-01		2.9E-01	8.8E-02				
				2.0E-02	I						1.36E+09		1	0.1	Dimethylphenol, 2,4-	105-67-9					1.6E+03	6.6E+03		1.3E+03
				6.0E-04	I						1.36E+09		1	0.1	Dimethylphenol, 2,6-	576-26-1					4.7E+01	2.0E+02		3.8E+01
				1.0E-03	I						1.36E+09		1	0.1	Dimethylphenol, 3,4-	95-65-8					7.8E+01	3.3E+02		6.3E+01
4.5E-02	C	1.3E-05	C					V		4.7E+02	1.36E+09	5.5E+03	1		Dimethylvinylchloride	513-37-1	1.5E+03		1.2E+02	1.1E+02				
				8.0E-05	X						1.36E+09		1	0.1	Dinitro-o-cresol, 4,6-	534-52-1					6.3E+00	2.6E+01		5.1E+00
				2.0E-03	I						1.36E+09		1	0.1	Dinitro-o-cyclohexyl Phenol, 4,6-	131-89-5					1.6E+02	6.6E+02		1.3E+02
				1.0E-04	P						1.36E+09		1	0.1	Dinitrobenzene, 1,2-	528-29-0					7.8E+00	3.3E+01		6.3E+00
				1.0E-04	I						1.36E+09		1	0.1	Dinitrobenzene, 1,3-	99-65-0					7.8E+00	3.3E+01		6.3E+00
				1.0E-04	P						1.36E+09		1	0.1	Dinitrobenzene, 1,4-	100-25-4					7.8E+00	3.3E+01		6.3E+00
				2.0E-03	I						1.36E+09		1	0.1	Dinitrophenol, 2,4-	51-28-5					1.6E+02	6.6E+02		1.3E+02
6.8E-01	I										1.36E+09		1	0.1	Dinitrotoluene Mixture, 2,4/2,6-	E1615210	1.0E+02	3.6E+02		8.0E+01				
3.1E-01	C	8.9E-05	C	2.0E-03	I						1.36E+09		1	0.1	Dinitrotoluene, 2,4-	121-14-2	2.2E+02	7.8E+02	4.3E+06	1.7E+02	1.6E+02	6.5E+02		1.3E+02
1.5E+00	P			3.0E-04	X						1.36E+09		1	0.099	Dinitrotoluene, 2,6-	606-20-2	4.6E+01	1.7E+02		3.6E+01	2.3E+01	1.0E+02		1.9E+01
				1.0E-04	X						1.36E+09		1	0.006	Dinitrotoluene, 2-Amino-4,6-	35572-78-2					7.8E+00	5.5E+02		7.7E+00
				1.0E-04	X						1.36E+09		1	0.009	Dinitrotoluene, 4-Amino-2,6-	19406-51-0					7.8E+00	3.7E+02		7.7E+00
4.5E-01	X			9.0E-04	X						1.36E+09		1	0.1	Dinitrotoluene, Technical grade	25321-14-6	1.5E+02	5.5E+02		1.2E+02	7.0E+01	3.0E+02		5.7E+01
				1.0E-03	I						1.36E+09		1	0.1	Dinoseb	88-85-7					7.8E+01	3.3E+02		6.3E+01
1.0E-01	I	5.0E-06	I	3.0E-02	I	3.0E-02	I	V		1.2E+05	1.36E+09	4.0E+04	1		Dioxane, 1,4-	123-91-1	7.0E+02		2.2E+03	5.3E+02	2.3E+03		1.2E+03	8.1E+02
															Dioxins									
6.2E+03	I	1.3E+00	I								1.36E+09		1	0.03	~Hexachlorodibenzo-p-dioxin, Mixture	34465-46-8	1.1E-02	1.3E-01	2.9E+02	1.0E-02				
1.3E+05	C	3.8E+01	C	7.0E-10	I	4.0E-08	C	V			1.36E+09	2.0E+06	1	0.03	~TCDD, 2,3,7,8-	1746-01-6	5.3E-04	6.3E-03	1.4E-02	4.8E-04	5.5E-05	7.7E-04	8.2E-02	5.1E-05
				3.0E-02	I						1.36E+09		1	0.1	Diphenamid	957-51-7					2.3E+03	9.9E+03		1.9E+03
						4.0E-04	X	V			1.36E+09	8.1E+04	1		Diphenyl Ether	101-84-8							3.4E+01	3.4E+01
				8.0E-04	X						1.36E+09		1	0.1	Diphenyl Sulfone	127-63-9					6.3E+01	2.6E+02		5.1E+01
				1.0E-01	O						1.36E+09		1	0.1	Diphenylamine	122-39-4					7.8E+03	3.3E+04		6.3E+03
8.0E-01	I	2.2E-04	I								1.36E+09		1	0.1	Diphenylhydrazine, 1,2-	122-66-7	8.7E+01	3.1E+02	1.7E+06	6.8E+01				
				2.2E-03	I						1.36E+09		1	0.1	Diquat	85-00-7					1.7E+02	7.3E+02		1.4E+02
7.4E+00	C	2.1E-03	C								1.36E+09		1	0.1	Direct Black 38	1937-37-7	9.4E+00	3.3E+01	1.8E+05	7.3E+00				
7.4E+00	C	2.1E-03	C								1.36E+09		1	0.1	Direct Blue 6	2602-46-2	9.4E+00	3.3E+01	1.8E+05	7.3E+00				
6.7E+00	C	1.9E-03	C								1.36E+09		1	0.1	Direct Brown 95	16071-86-6	1.0E+01	3.7E+01	2.0E+05	8.1E+00				
				4.0E-05	I						1.36E+09		1	0.1	Disulfoton	298-04-4					3.1E+00	1.3E+01		2.5E+00
				1.0E-02	I			V			1.36E+09	4.5E+04	1		Dithiane, 1,4-	505-29-3					7.8E+02			7.8E+02
				2.0E-03	I						1.36E+09		1	0.1	Diuron	330-54-1					1.6E+02	6.6E+02		1.3E+02
				2.0E-02	O						1.36E+09		1	0.1	Dodine	2439-10-3					1.6E+03	6.6E+03		1.3E+03
				5.0E-02	O			V			1.36E+09	1.2E+05	1		EPTC	759-94-4					3.9E+03			3.9E+03
				6.0E-03	I			V			1.36E+09	4.1E+05	1		Endosulfan	115-29-7					4.7E+02			4.7E+02
				6.0E-03	P						1.36E+09		1	0.1	Endosulfan Sulfate	1031-07-8					4.7E+02	2.0E+03		3.8E+02
				2.0E-02	I						1.36E+09		1	0.1	Endothall	145-73-3					1.6E+03	6.6E+03		1.3E+03
				3.0E-04	I						1.36E+09		1	0.1	Endrin	72-20-8					2.3E+01	9.9E+01		1.9E+01
9.9E-03	I	1.2E-06	I	6.0E-03	P	1.0E-03	I	V		1.1E+04	1.36E+09	1.9E+04	1		Epichlorohydrin	106-89-8	7.0E+03		4.4E+03	2.7E+03	4.7E+02		2.0E+01	1.9E+01
						2.0E-02	I	V		1.5E+04	1.36E+09	7.7E+03	1		Epoxybutane, 1,2-	106-88-7							1.6E+02	1.6E+02
				4.0E-02	P						1.36E+09		1	0.1	Ethanol, 2-(2-methoxyethoxy)-	111-77-3					3.1E+03	1.3E+04		2.5E+03
				5.0E-03	I						1.36E+09		1	0.1	Ethephon	16672-87-0					3.9E+02	1.6E+03		3.2E+02
				5.0E-04	I						1.36E+09		1	0.1	Ethion	563-12-2					3.9E+01	1.6E+02		3.2E+01
				1.0E-01	P	6.0E-02	P	V		2.4E+04	1.36E+09	6.2E+04	1		Ethoxyethanol Acetate, 2-	111-15-9					7.8E+03		3.8E+03	2.6E+03
				9.0E-02	P	2.0E-01	I	V		1.1E+05	1.36E+09	9.8E+04	1		Ethoxyethanol, 2-	110-80-5					7.0E+03		2.1E+04	5.2E+03
				9.0E-01	I	7.0E-02	P	V		1.1E+04	1.36E+09	8.6E+03	1		Ethyl Acetate	141-78-6					7.0E+04		6.3E+02	6.2E+02
				5.0E-03	P	8.0E-03	P	V		2.5E+03	1.36E+09	6.3E+03	1		Ethyl Acrylate	140-88-5					3.9E+02		5.3E+01	4.7E+01
						1.0E+01	I	V		2.1E+03	1.36E+09	1.3E+03	1		Ethyl Chloride (Chloroethane)	75-00-3							1.4E+04	1.4E+04
				2.0E-01	I			V		1.0E+04	1.36E+09	3.1E+03	1		Ethyl Ether	60-29-7					1.6E+04			1.6E+04
						3.0E-01	P	V		1.1E+03	1.36E+09	5.8E+03	1		Ethyl Methacrylate	97-63-2							1.8E+03	1.8E+03
				1.0E-05	I						1.36E+09		1	0.1	Ethyl-p-nitrophenyl Phosphonate	2104-64-5					7.8E-01	3.3E+00		6.3E-01

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
1.1E-02	C	2.5E-06	C	1.0E-01	I	1.0E+00	I	V		4.8E+02	1.36E+09	5.7E+03	1		Ethylbenzene	100-41-4	6.3E+03		6.4E+02	5.8E+02	7.8E+03		5.9E+03	3.4E+03
				7.0E-02	P						1.36E+09		1	0.1	Ethylene Cyanohydrin	109-78-4					5.5E+03	2.3E+04		4.4E+03
				9.0E-02	P			V		1.9E+05	1.36E+09	1.8E+05	1		Ethylene Diamine	107-15-3					7.0E+03			7.0E+03
				2.0E+00	I	4.0E-01	C				1.36E+09		1	0.1	Ethylene Glycol	107-21-1					1.6E+05	6.6E+05	5.7E+08	1.3E+05
				1.0E-01	I	1.6E+00	I				1.36E+09		1	0.1	Ethylene Glycol Monobutyl Ether	111-76-2					7.8E+03	3.3E+04	2.3E+09	6.3E+03
3.1E-01	C	3.0E-03	I			3.0E-02	C	V	M	1.2E+05	1.36E+09	6.1E+03	1		Ethylene Oxide	75-21-8	4.9E+01		2.1E-01	2.0E-01			1.9E+02	1.9E+02
4.5E-02	C	1.3E-05	C	8.0E-05	I						1.36E+09		1	0.1	Ethylene Thiourea	96-45-7	1.5E+03	5.5E+03	2.9E+07	1.2E+03	6.3E+00	2.6E+01		5.1E+00
6.5E+01	C	1.9E-02	C					V		1.5E+05	1.36E+09	2.4E+04	1		Ethyleneimine	151-56-4	1.1E+00		3.5E-01	2.7E-01				
				3.0E+00	I						1.36E+09		1	0.1	Ethylphthalyl Ethyl Glycolate	84-72-0					2.3E+05	9.9E+05		1.9E+05
				2.5E-04	I						1.36E+09		1	0.1	Fenamiphos	22224-92-6					2.0E+01	8.2E+01		1.6E+01
				2.5E-02	I						1.36E+09		1	0.1	Fenpropathrin	39515-41-8					2.0E+03	8.2E+03		1.6E+03
				2.5E-02	I						1.36E+09		1	0.1	Fenvalerate	51630-58-1					2.0E+03	8.2E+03		1.6E+03
				1.3E-02	I						1.36E+09		1	0.1	Fluometuron	2164-17-2					1.0E+03	4.3E+03		8.2E+02
				4.0E-02	C	1.3E-02	C				1.36E+09		1		Fluoride	16984-48-8					3.1E+03		1.8E+07	3.1E+03
				6.0E-02	I	1.3E-02	C				1.36E+09		1		Fluorine (Soluble Fluoride)	7782-41-4					4.7E+03		1.8E+07	4.7E+03
				8.0E-02	I						1.36E+09		1	0.1	Fluridone	59756-60-4					6.3E+03	2.6E+04		5.1E+03
				4.0E-02	O						1.36E+09		1	0.1	Flurprimidol	56425-91-3					3.1E+03	1.3E+04		2.5E+03
				2.0E-03	O						1.36E+09		1	0.1	Flusilazole	85509-19-9					1.6E+02	6.6E+02		1.3E+02
				5.0E-01	O						1.36E+09		1	0.1	Flutolanil	66332-96-5					3.9E+04	1.6E+05		3.2E+04
				1.0E-02	I						1.36E+09		1	0.1	Fluvalinate	69409-94-5					7.8E+02	3.3E+03		6.3E+02
				9.0E-02	O						1.36E+09		1	0.1	Folpet	133-07-3					7.0E+03	3.0E+04		5.7E+03
				2.5E-03	O						1.36E+09		1	0.1	Fomesafen	72178-02-0					2.0E+02	8.2E+02		1.6E+02
				2.0E-03	I						1.36E+09		1	0.1	Fonofos	944-22-9					1.6E+02	6.6E+02		1.3E+02
2.1E-02	C	1.3E-05	I	2.0E-01	I	9.8E-03	A	V		4.2E+04	1.36E+09	7.8E+04	1		Formaldehyde	50-00-0	3.3E+03		1.7E+03	1.1E+03	1.6E+04		8.0E+02	7.6E+02
				9.0E-01	P	3.0E-04	X	V		1.1E+05	1.36E+09	9.3E+04	1		Formic Acid	64-18-6					7.0E+04		2.9E+01	2.9E+01
				2.5E+00	O						1.36E+09		1	0.1	Fosetyl-AL	39148-24-8					2.0E+05	8.2E+05		1.6E+05
															Furans									
				1.0E-03	X			V			1.36E+09	1.6E+05	1		~Dibenzofuran	132-64-9					7.8E+01			7.8E+01
				1.0E-03	I			V		6.2E+03	1.36E+09	2.6E+03	1		~Furan	110-00-9					7.8E+01			7.8E+01
				9.0E-01	I	2.0E+00	I	V		1.7E+05	1.36E+09	1.2E+04	1		~Tetrahydrofuran	109-99-9					7.0E+04		2.5E+04	1.8E+04
3.8E+00	H										1.36E+09		1	0.1	Furazolidone	67-45-8	1.8E+01	6.5E+01		1.4E+01				
				3.0E-03	I	5.0E-02	H	V		1.0E+04	1.36E+09	4.9E+04	1		Furfural	98-01-1					2.3E+02		2.5E+03	2.1E+02
1.5E+00	C	4.3E-04	C								1.36E+09		1	0.1	Furium	531-82-8	4.6E+01	1.6E+02	8.9E+05	3.6E+01				
3.0E-02	I	8.6E-06	C								1.36E+09		1	0.1	Furmecyclox	60568-05-0	2.3E+03	8.2E+03	4.4E+07	1.8E+03				
				6.0E-03	O						1.36E+09		1	0.1	Glufosinate, Ammonium	77182-82-2					4.7E+02	2.0E+03		3.8E+02
				1.0E-01	A	8.0E-05	C				1.36E+09		1	0.1	Glutaraldehyde	111-30-8					7.8E+03	3.3E+04	1.1E+05	6.0E+03
				4.0E-04	I	1.0E-03	H	V		1.1E+05	1.36E+09	8.4E+04	1		Glycidyl	765-34-4					3.1E+01		8.8E+01	2.3E+01
				1.0E-01	I						1.36E+09		1	0.1	Glyphosate	1071-83-6					7.8E+03	3.3E+04		6.3E+03
				1.0E-02	X			V			1.36E+09	1.5E+05	1		Guanidine	113-00-8					7.8E+02			7.8E+02
				2.0E-02	P						1.36E+09		1	0.1	Guanidine Chloride	50-01-1					1.6E+03	6.6E+03		1.3E+03
				3.0E-02	X						1.36E+09		1	0.1	Guanidine Nitrate	506-93-4					2.3E+03	9.9E+03		1.9E+03
				5.0E-05	I						1.36E+09		1	0.1	Haloxyfop, Methyl	69806-40-2					3.9E+00	1.6E+01		3.2E+00
4.5E+00	I	1.3E-03	I	5.0E-04	I			V			1.36E+09	4.8E+05	1		Heptachlor	76-44-8	1.5E+01		1.0E+02	1.3E+01	3.9E+01			3.9E+01
9.1E+00	I	2.6E-03	I	1.3E-05	I			V			1.36E+09	8.4E+05	1		Heptachlor Epoxide	1024-57-3	7.6E+00		9.1E+01	7.0E+00	1.0E+00			1.0E+00
						3.0E-03	X	V		2.1E+02	1.36E+09	7.8E+03	1		Heptanal, n-	111-71-7							2.4E+01	2.4E+01
				3.0E-04	X	4.0E-01	P	V		5.8E+01	1.36E+09	9.0E+02	1		Heptane, N-	142-82-5					2.3E+01		3.7E+02	2.2E+01
				2.0E-03	I			V			1.36E+09	3.8E+05	1		Hexabromobenzene	87-82-1					1.6E+02			1.6E+02
				2.0E-04	I						1.36E+09		1	0.1	Hexabromodiphenyl ether, 2,2',4,4',5,5'- (BDE-153)	68631-49-2					1.6E+01	6.6E+01		1.3E+01
1.6E+00	I	4.6E-04	I	8.0E-04	I			V			1.36E+09	6.8E+04	1		Hexachlorobenzene	118-74-1	4.3E+01		4.1E+01	2.1E+01	6.3E+01			6.3E+01
7.8E-02	I	2.2E-05	I	1.0E-03	P			V		1.7E+01	1.36E+09	1.1E+04	1		Hexachlorobutadiene	87-68-3	8.9E+02		1.4E+02	1.2E+02	7.8E+01			7.8E+01
6.3E+00	I	1.8E-03	I	8.0E-03	A						1.36E+09		1	0.1	Hexachlorocyclohexane, Alpha-	319-84-6	1.1E+01	3.9E+01	2.1E+05	8.6E+00	6.3E+02	2.6E+03		5.1E+02
1.8E+00	I	5.3E-04	I								1.36E+09		1	0.1	Hexachlorocyclohexane, Beta-	319-85-7	3.9E+01	1.4E+02	7.2E+05	3.0E+01				
1.1E+00	C	3.1E-04	C	3.0E-04	I						1.36E+09		1	0.04	Hexachlorocyclohexane, Gamma- (Lindane)	58-89-9	6.3E+01	5.6E+02	1.2E+06	5.7E+01	2.3E+01	2.5E+02		2.1E+01
1.8E+00	I	5.1E-04	I								1.36E+09		1	0.1	Hexachlorocyclohexane, Technical	608-73-1	3.9E+01	1.4E+02	7.5E+05	3.0E+01				
				6.0E-03	I	2.0E-04	I	V		1.6E+01	1.36E+09	8.5E+03	1		Hexachlorocyclopentadiene	77-47-4					4.7E+02		1.8E+00	1.8E+00
4.0E-02	I	1.1E-05	C	7.0E-04	I	3.0E-02	I	V			1.36E+09	8.0E+03	1		Hexachloroethane	67-72-1	1.7E+03		2.0E+02	1.8E+02	5.5E+01		2.5E+02	4.5E+01
				3.0E-04	I						1.36E+09		1	0.1	Hexachlorophene	70-30-4					2.3E+01	9.9E+01		1.9E+01
8.0E-02	I			4.0E-03	I						1.36E+09		1	0.015	Hexahydro-1,3,5-trinitro-1,3,5-triazine (RDX)	121-82-4	8.7E+02	2.1E+04		8.3E+02	3.1E+02	8.8E+03		3.0E+02
						1.0E-05	I	V		3.4E+03	1.36E+09	3.0E+05	1		Hexamethylene Diisocyanate, 1,6-	822-06-0							3.1E+00	3.1E+00
						4.0E-04	C				1.36E+09		1	0.1	Hexamethylene diisocyanate biuret	4035-89-6							5.7E+05	5.7E+05
						4.0E-04	C				1.36E+09		1	0.1	Hexamethylene diisocyanate isocyanurate	3779-63-3							5.7E+05	5.7E+05
				4.0E-04	P						1.36E+09		1	0.1	Hexamethylphosphoramide	680-31-9					3.1E+01	1.3E+02		2.5E+01
		2.0E-07	X			6.0E-01	P	V		1.4E+02	1.36E+09	8.3E+02	1		Hexane, Commercial				1.2E+03	1.2E+03			5.2E+02	5.2E+02
						7.0E-01	I	V		1.4E+02	1.36E+09	8.3E+02	1		Hexane, N-	110-54-3							6.1E+02	6.1E+02
				2.0E+00	P						1.36E+09		1	0.1	Hexanedioic Acid	124-04-9					1.6E+05	6.6E+05		1.3E+05
9.5E-03	P			7.0E-02	P	4.0E-04	P	V		2.7E+02	1.36E+09	3.6E+04	1		Hexanol, 1-,2-ethyl- (2-Ethyl-1-hexanol)	104-76-7	7.3E+03			7.3E+03	5.5E+03		1.5E+01	1.5E+01
				5.0E-03	I	3.0E-02	I	V		3.3E+03	1.36E+09	1.3E+04	1		Hexanone, 2-	591-78-6					3.9E+02		4.2E+02	2.0E+02
				3.3E-02	I						1.36E+09		1	0.1	Hexazinone	51235-04-2					2.6E+03	1.1E+04		2.1E+03
				2.5E-02	I						1.36E+09		1	0.1	Hexythiazox	78587-05-0					2.0E+03	8.2E+03		1.6E+03
				1.7E-02	O						1.36E+09		1	0.1	Hydramethylnon	67485-29-4					1.3E+03	5.6E+03		1.1E+03
3.0E+00	I	4.9E-03	I			3.0E-05	P	V		1.1E+05	1.36E+09	6.5E+04	1		Hydrazine	302-01-2	2.3E+01		3.7E+00	3.2E+00			2.0E+00	2.0E+00
3.0E+00	I	4.9E-03	I								1.36E+09		1		Hydrazine Sulfate	10034-93-2	2.3E+01		7.8E+04	2.3E+01				
						2.0E-02	I	V			1.36E+09		1		Hydrogen Chloride	7647-01-0							2.8E+07	2.8E+07
				4.0E-02	C	1.4E-02	C	V			1.36E+09		1		Hydrogen Fluoride	7664-39-3					3.1E+03		2.0E+07	3.1E+03
						2.0E-03	I	V			1.36E+09		1		Hydrogen Sulfide	7783-06-4							2.8E+06	2.8E+06
6.0E-02	P			4.0E-02	P						1.36E+09		1	0.1	Hydroquinone	123-31-9	1.2E+03	4.1E+03		9.0E+02	3.1E+03	1.3E+04		2.5E+03
6.1E-02	O			2.5E-03	O						1.36E+09		1	0.1	Imazalil	35554-44-0	1.1E+03	4.0E+03		8.9E+02	2.0E+02	8.2E+02		1.6E+02
				2.5E-01	I						1.36E+09		1	0.1	Imazaquin	81335-37-7					2.0E+04	8.2E+04		1.6E+04
				2.5E+00	O						1.36E+09		1	0.1	Imazethapyr	81335-77-5					2.0E+05	8.2E+05		1.6E+05

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Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				1.0E-02	A						1.36E+09		1		Iodine	7553-56-2					7.8E+02			7.8E+02
				4.0E-02	I						1.36E+09		1	0.1	Iprodione	36734-19-7					3.1E+03	1.3E+04		2.5E+03
				7.0E-01	P						1.36E+09		1		Iron	7439-89-6					5.5E+04			5.5E+04
				3.0E-01	I			V		1.0E+04	1.36E+09	2.8E+04	1		Isobutyl Alcohol	78-83-1					2.3E+04			2.3E+04
9.5E-04	I			2.0E-01	I	2.0E+00	C				1.36E+09		1	0.1	Isophorone	78-59-1	7.3E+04	2.6E+05		5.7E+04	1.6E+04	6.6E+04	2.8E+09	1.3E+04
				1.5E-02	I			V			1.36E+09	4.2E+05	1		Isopropalin	33820-53-0					1.2E+03			1.2E+03
				2.0E+00	P	2.0E-01	P	V		1.1E+05	1.36E+09	2.8E+04	1		Isopropanol	67-63-0					1.6E+05		5.8E+03	5.6E+03
				1.0E-01	I						1.36E+09		1	0.1	Isopropyl Methyl Phosphonic Acid	1832-54-8					7.8E+03	3.3E+04		6.3E+03
				5.0E-02	I						1.36E+09		1	0.1	Isoxaben	82558-50-7					3.9E+03	1.6E+04		3.2E+03
						3.0E-01	A	V			1.36E+09		1		JP-7	E1737665							4.3E+08	4.3E+08
				8.0E-03	O						1.36E+09		1	0.1	Lactofen	77501-63-4					6.3E+02	2.6E+03		5.1E+02
				2.0E-04	X						1.36E+09		1	0.1	Lactonitrile	78-97-7					1.6E+01	6.6E+01		1.3E+01
				5.0E-05	P						1.36E+09		1		Lanthanum	7439-91-0					3.9E+00			3.9E+00
				2.1E-05	P						1.36E+09		1	0.1	Lanthanum Acetate Hydrate	100587-90-4					1.6E+00	6.9E+00		1.3E+00
				1.9E-05	P						1.36E+09		1		Lanthanum Chloride Heptahydrate	10025-84-0					1.5E+00			1.5E+00
				2.8E-05	P						1.36E+09		1		Lanthanum Chloride, Anhydrous	10099-58-8					2.2E+00			2.2E+00
				1.6E-05	P						1.36E+09		1		Lanthanum Nitrate Hexahydrate	10277-43-7					1.3E+00			1.3E+00
															Lead Compounds									
8.5E-03	C	1.2E-05	C								1.36E+09		1		~Lead Phosphate	7446-27-7	8.2E+03		3.2E+07	8.2E+03				
2.1E-01	C	8.0E-05	C								1.36E+09		1	0.1	~Lead acetate	301-04-2	3.3E+02	1.2E+03	4.8E+06	2.6E+02				
											1.36E+09		1		~Lead and Compounds	7439-92-1								4.0E+02
3.8E-02	C	1.1E-05	C								1.36E+09		1	0.1	~Lead *subacetate*	1335-32-6	1.8E+03	6.5E+03	3.5E+07	1.4E+03				
				1.0E-07	I			V		2.4E+00	1.36E+09	1.9E+03	1		~Tetraethyl Lead	78-00-2					7.8E-03			7.8E-03
				5.0E-06	P			V		3.8E+02	1.36E+09	2.6E+04	1		Lewisite	541-25-3					3.9E-01			3.9E-01
				7.7E-03	O						1.36E+09		1	0.1	Linuron	330-55-2					6.0E+02	2.5E+03		4.9E+02
				2.0E-03	P						1.36E+09		1		Lithium	7439-93-2					1.6E+02			1.6E+02
				5.0E-04	I						1.36E+09		1	0.1	MCPA	94-74-6					3.9E+01	1.6E+02		3.2E+01
				4.4E-03	O						1.36E+09		1	0.1	MCPB	94-81-5					3.4E+02	1.5E+03		2.8E+02
				1.0E-03	I						1.36E+09		1	0.1	MCPP	93-65-2					7.8E+01	3.3E+02		6.3E+01
				2.0E-02	I						1.36E+09		1	0.1	Malathion	121-75-5					1.6E+03	6.6E+03		1.3E+03
				1.0E-01	I	7.0E-04	C				1.36E+09		1	0.1	Maleic Anhydride	108-31-6					7.8E+03	3.3E+04	9.9E+05	6.3E+03
				5.0E-01	I						1.36E+09		1	0.1	Maleic Hydrazide	123-33-1					3.9E+04	1.6E+05		3.2E+04
				1.0E-04	P						1.36E+09		1	0.1	Malononitrile	109-77-3					7.8E+00	3.3E+01		6.3E+00
				3.0E-02	H						1.36E+09		1	0.1	Mancozeb	8018-01-7					2.3E+03	9.9E+03		1.9E+03
				5.0E-03	I						1.36E+09		1	0.1	Maneb	12427-38-2					3.9E+02	1.6E+03		3.2E+02
				1.4E-01	I	5.0E-05	I						1		Manganese (Diet)	7439-96-5								
				2.4E-02	G	5.0E-05	I				1.36E+09		0.04		Manganese (Non-diet)	7439-96-5					1.9E+03		7.1E+04	1.8E+03
				9.0E-05	H						1.36E+09		1	0.1	Mephosfolan	950-10-7					7.0E+00	3.0E+01		5.7E+00
				3.0E-02	I						1.36E+09		1	0.1	Mepiquat Chloride	24307-26-4					2.3E+03	9.9E+03		1.9E+03
1.1E-02	P			4.0E-03	P						1.36E+09		1	0.1	Mercaptobenzothiazole, 2-	149-30-4	6.3E+03	2.2E+04		4.9E+03	3.1E+02	1.3E+03		2.5E+02
															Mercury Compounds									
				3.0E-04	I	3.0E-04	G				1.36E+09		0.07		~Mercuric Chloride (and other Mercury salts)	7487-94-7					2.3E+01		4.3E+05	2.3E+01
						3.0E-04	I	V		3.1E+00	1.36E+09	3.5E+04	1		~Mercury (elemental)	7439-97-6							1.1E+01	1.1E+01
				1.0E-04	I						1.36E+09		1		~Methyl Mercury	22967-92-6					7.8E+00			7.8E+00
				8.0E-05	I						1.36E+09		1	0.1	~Phenylmercuric Acetate	62-38-4					6.3E+00	2.6E+01		5.1E+00
				3.0E-05	I			V			1.36E+09	1.9E+06	1		Merphos	150-50-5					2.3E+00			2.3E+00
				1.0E-04	O						1.36E+09		1	0.1	Merphos Oxide	78-48-8					7.8E+00	3.3E+01		6.3E+00
				6.0E-02	I						1.36E+09		1	0.1	Metalaxyl	57837-19-1					4.7E+03	2.0E+04		3.8E+03
				1.0E-04	I	3.0E-02	P	V		4.6E+03	1.36E+09	6.8E+03	1		Methacrylonitrile	126-98-7					7.8E+00		2.1E+02	7.5E+00
				5.0E-05	I						1.36E+09		1	0.1	Methamidophos	10265-92-6					3.9E+00	1.6E+01		3.2E+00
				2.0E+00	I	2.0E+01	I	V		1.1E+05	1.36E+09	2.9E+04	1		Methanol	67-56-1					1.6E+05		6.1E+05	1.2E+05
				1.5E-03	O						1.36E+09		1	0.1	Methidathion	950-37-8					1.2E+02	4.9E+02		9.5E+01
				2.5E-02	I						1.36E+09		1	0.1	Methomyl	16752-77-5					2.0E+03	8.2E+03		1.6E+03
4.9E-02	C										1.36E+09		1	0.1	Methoxy-5-nitroaniline, 2-	99-59-2	1.4E+03	5.0E+03		1.1E+03				
				5.0E-03	I						1.36E+09		1	0.1	Methoxychlor	72-43-5					3.9E+02	1.6E+03		3.2E+02
				8.0E-03	P	1.0E-03	P	V		1.2E+05	1.36E+09	1.2E+05	1		Methoxyethanol Acetate, 2-	110-49-6					6.3E+02		1.3E+02	1.1E+02
				5.0E-03	P	2.0E-02	I	V		1.1E+05	1.36E+09	1.0E+05	1		Methoxyethanol, 2-	109-86-4					3.9E+02		2.1E+03	3.3E+02
				1.0E+00	X			V		2.9E+04	1.36E+09	8.1E+03	1		Methyl Acetate	79-20-9					7.8E+04			7.8E+04
						2.0E-02	P	V		6.8E+03	1.36E+09	7.0E+03	1		Methyl Acrylate	96-33-3							1.5E+02	1.5E+02
				6.0E-01	I	5.0E+00	I	V		2.8E+04	1.36E+09	1.2E+04	1		Methyl Ethyl Ketone (2-Butanone)	78-93-3					4.7E+04		6.4E+04	2.7E+04
		1.0E-03	X	1.0E-03	P	2.0E-05	X	V		1.8E+05	1.36E+09	5.0E+04	1		Methyl Hydrazine	60-34-4			1.4E+01	1.4E+01	7.8E+01		1.1E+00	1.0E+00
						3.0E+00	I	V		3.4E+03	1.36E+09	1.1E+04	1		Methyl Isobutyl Ketone (4-methyl-2-pentanone)	108-10-1							3.3E+04	3.3E+04
						1.0E-03	C	V		1.0E+04	1.36E+09	4.4E+03	1		Methyl Isocyanate	624-83-9							4.6E+00	4.6E+00
				1.4E+00	I	7.0E-01	I	V		2.4E+03	1.36E+09	6.3E+03	1		Methyl Methacrylate	80-62-6					1.1E+05		4.6E+03	4.4E+03
				2.5E-04	I						1.36E+09		1	0.1	Methyl Parathion	298-00-0					2.0E+01	8.2E+01		1.6E+01
				6.0E-02	X						1.36E+09		1	0.1	Methyl Phosphonic Acid	993-13-5					4.7E+03	2.0E+04		3.8E+03
				6.0E-03	H	4.0E-02	H	V		3.9E+02	1.36E+09	2.4E+04	1		Methyl Styrene (Mixed Isomers)	25013-15-4					4.7E+02		1.0E+03	3.2E+02
9.9E-02	C	2.8E-05	C								1.36E+09		1	0.1	Methyl methanesulfonate	66-27-3	7.0E+02	2.5E+03	1.4E+07	5.5E+02				
1.8E-03	C	2.6E-07	C			3.0E+00	I	V		8.9E+03	1.36E+09	4.9E+03	1		Methyl tert-Butyl Ether (MTBE)	1634-04-4	3.9E+04		5.3E+03	4.7E+03			1.5E+04	1.5E+04
				3.0E-04	X						1.36E+09		1	0.1	Methyl-1,4-benzenediamine dihydrochloride, 2-	615-45-2					2.3E+01	9.9E+01		1.9E+01
						3.0E+00	X	V		2.5E+03	1.36E+09	1.7E+04	1		Methyl-2-Pentanol, 4-	108-11-2							5.4E+04	5.4E+04
9.0E-03	P			2.0E-02	X						1.36E+09		1	0.1	Methyl-5-Nitroaniline, 2-	99-55-8	7.7E+03	2.7E+04		6.0E+03	1.6E+03	6.6E+03		1.3E+03
8.3E+00	C	2.4E-03	C								1.36E+09		1	0.1	Methyl-N-nitro-N-nitrosoguanidine, N-	70-25-7	8.4E+00	3.0E+01	1.6E+05	6.5E+00				
1.3E-01	C	3.7E-05	C								1.36E+09		1	0.1	Methylaniline Hydrochloride, 2-	636-21-5	5.3E+02	1.9E+03	1.0E+07	4.2E+02				
				1.0E-02	A						1.36E+09		1	0.1	Methylarsonic acid	124-58-3					7.8E+02	3.3E+03		6.3E+02
				2.0E-04	X						1.36E+09		1	0.1	Methylbenzene,1-4-diamine monohydrochloride, 2-	74612-12-7					1.6E+01	6.6E+01		1.3E+01
1.0E-01	X			3.0E-04	X						1.36E+09		1	0.1	Methylbenzene-1,4-diamine sulfate, 2-	615-50-9	7.0E+02	2.5E+03		5.4E+02	2.3E+01	9.9E+01		1.9E+01
2.2E+01	C	6.3E-03	C						M		1.36E+09		1	0.1	Methylcholanthrene, 3-	56-49-5	7.0E-01	2.7E+00	2.2E+04	5.5E-01				
2.0E-03	I	1.0E-08	I	6.0E-03	I	6.0E-01	I	V	M	3.3E+03	1.36E+09	2.2E+03	1		Methylene Chloride	75-09-2	7.7E+03		2.2E+04	5.7E+03	4.7E+02		1.4E+03	3.5E+02

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD$_o$ (mg/kg-day)	key	RfC$_i$ (mg/m^3)	key	vol	mutagen	C$_{sat}$ (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS$_d$	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
1.0E-01	P	4.3E-04	C	2.0E-03	P				M		1.36E+09		1	0.1	Methylene-bis(2-chloroaniline), 4,4'-	101-14-4	1.5E+02	6.0E+02	3.2E+05	1.2E+02	1.6E+02	6.6E+02		1.3E+02
4.6E-02	I	1.3E-05	C								1.36E+09		1	0.1	Methylene-bis(N,N-dimethyl) Aniline, 4,4'-	101-61-1	1.5E+03	5.4E+03	2.9E+07	1.2E+03				
1.6E+00	C	4.6E-04	C			2.0E-02	C				1.36E+09		1	0.1	Methylenebisbenzenamine, 4,4'-	101-77-9	4.3E+01	1.5E+02	8.3E+05	3.4E+01			2.8E+07	2.8E+07
						6.0E-04	I				1.36E+09		1	0.1	Methylenediphenyl Diisocyanate	101-68-8							8.5E+05	8.5E+05
				7.0E-02	H			V		5.0E+02	1.36E+09	1.3E+04	1		Methylstyrene, Alpha-	98-83-9					5.5E+03			5.5E+03
				1.5E-01	I						1.36E+09		1	0.1	Metolachlor	51218-45-2					1.2E+04	4.9E+04		9.5E+03
				2.5E-02	I						1.36E+09		1	0.1	Metribuzin	21087-64-9					2.0E+03	8.2E+03		1.6E+03
				2.5E-01	I						1.36E+09		1	0.1	Metsulfuron-methyl	74223-64-6					2.0E+04	8.2E+04		1.6E+04
				3.0E+00	P			V		3.4E-01	1.36E+09	1.4E+03	1		Mineral oils	8012-95-1					2.3E+05			2.3E+05
1.8E+01	C	5.1E-03	C	2.0E-04	I			V			1.36E+09	8.6E+05	1		Mirex	2385-85-5	3.9E+00		4.7E+01	3.6E+00	1.6E+01			1.6E+01
				2.0E-03	I						1.36E+09		1	0.1	Molinate	2212-67-1					1.6E+02	6.6E+02		1.3E+02
				5.0E-03	I						1.36E+09		1		Molybdenum	7439-98-7					3.9E+02			3.9E+02
				1.0E-01	I						1.36E+09		1		Monochloramine	10599-90-3					7.8E+03			7.8E+03
				2.0E-03	P						1.36E+09		1	0.1	Monomethylaniline	100-61-8					1.6E+02	6.6E+02		1.3E+02
				2.5E-02	I						1.36E+09		1	0.1	Myclobutanil	88671-89-0					2.0E+03	8.2E+03		1.6E+03
				3.0E-04	X						1.36E+09		1	0.1	N,N'-Diphenyl-1,4-benzenediamine	74-31-7					2.3E+01	9.9E+01		1.9E+01
				2.0E-03	I			V			1.36E+09	5.7E+04	1		Naled	300-76-5					1.6E+02			1.6E+02
				3.0E-02	X	1.0E-01	P	V			1.36E+09		1		Naphtha, High Flash Aromatic (HFAN)	64742-95-6					2.3E+03		1.4E+08	2.3E+03
1.8E+00	C	0.0E+00	C								1.36E+09		1	0.1	Naphthylamine, 2-	91-59-8	3.9E+01	1.4E+02		3.0E+01				
				1.2E-01	O						1.36E+09		1	0.1	Napropamide	15299-99-7					9.4E+03	4.0E+04		7.6E+03
9.1E-01	C	2.6E-04	C	1.1E-02	C	1.4E-05	C				1.36E+09		1	0.1	Nickel Acetate	373-02-4	7.6E+01	2.7E+02	1.5E+06	6.0E+01	8.6E+02	3.6E+03	2.0E+04	6.7E+02
9.1E-01	C	2.6E-04	C	1.1E-02	C	1.4E-05	C				1.36E+09		1	0.1	Nickel Carbonate	3333-67-3	7.6E+01	2.7E+02	1.5E+06	6.0E+01	8.6E+02	3.6E+03	2.0E+04	6.7E+02
9.1E-01	C	2.6E-04	C	1.1E-02	C	1.4E-05	C	V			1.36E+09		1		Nickel Carbonyl	13463-39-3	7.6E+01		1.5E+06	7.6E+01	8.6E+02		2.0E+04	8.2E+02
9.1E-01	C	2.6E-04	C	1.1E-02	C	1.4E-05	C				1.36E+09		0.04		Nickel Hydroxide	12054-48-7	7.6E+01		1.5E+06	7.6E+01	8.6E+02		2.0E+04	8.2E+02
9.1E-01	C	2.6E-04	C	1.1E-02	C	2.0E-05	C				1.36E+09		0.04		Nickel Oxide	1313-99-1	7.6E+01		1.5E+06	7.6E+01	8.6E+02		2.8E+04	8.4E+02
9.1E-01	C	2.4E-04	I	1.1E-02	C	1.4E-05	C				1.36E+09		0.04		Nickel Refinery Dust	E715532	7.6E+01		1.6E+06	7.6E+01	8.6E+02		2.0E+04	8.2E+02
		2.6E-04	C	2.0E-02	I	9.0E-05	A				1.36E+09		0.04		Nickel Soluble Salts	7440-02-0			1.5E+06	1.5E+06	1.6E+03		1.3E+05	1.5E+03
1.7E+00	C	4.8E-04	I	1.1E-02	C	1.4E-05	C				1.36E+09		0.04		Nickel Subsulfide	12035-72-2	4.1E+01		8.0E+05	4.1E+01	8.6E+02		2.0E+04	8.2E+02
9.1E-01	C	2.6E-04	C	1.1E-02	C	1.4E-05	C				1.36E+09		1	0.1	Nickelocene	1271-28-9	7.6E+01	2.7E+02	1.5E+06	6.0E+01	8.6E+02	3.6E+03	2.0E+04	6.7E+02
				1.6E+00	I						1.36E+09		1		Nitrate (measured as nitrogen)	14797-55-8					1.3E+05			1.3E+05
											1.36E+09		1		Nitrate + Nitrite (measured as nitrogen)	E701177								
				1.0E-01	I						1.36E+09		1		Nitrite (measured as nitrogen)	14797-65-0					7.8E+03			7.8E+03
				1.0E-02	X	5.0E-05	X				1.36E+09		1	0.1	Nitroaniline, 2-	88-74-4					7.8E+02	3.3E+03	7.1E+04	6.3E+02
2.0E-02	P			4.0E-03	P	6.0E-03	P				1.36E+09		1	0.1	Nitroaniline, 4-	100-01-6	3.5E+03	1.2E+04		2.7E+03	3.1E+02	1.3E+03	8.5E+06	2.5E+02
		4.0E-05	I	2.0E-03	I	9.0E-03	I	V		3.1E+03	1.36E+09	7.3E+04	1		Nitrobenzene	98-95-3			5.1E+02	5.1E+02	1.6E+02		6.9E+02	1.3E+02
				3.0E+03	P						1.36E+09		1	0.1	Nitrocellulose	9004-70-0					2.3E+08	9.9E+08		1.9E+08
				7.0E-02	H						1.36E+09		1	0.1	Nitrofurantoin	67-20-9					5.5E+03	2.3E+04		4.4E+03
1.3E+00	C	3.7E-04	C								1.36E+09		1	0.1	Nitrofurazone	59-87-0	5.3E+01	1.9E+02	1.0E+06	4.2E+01				
1.7E-02	P			1.0E-04	P						1.36E+09		1	0.1	Nitroglycerin	55-63-0	4.1E+03	1.5E+04		3.2E+03	7.8E+00	3.3E+01		6.3E+00
				1.0E-01	I						1.36E+09		1	0.1	Nitroguanidine	556-88-7					7.8E+03	3.3E+04		6.3E+03
		8.8E-06	P			5.0E-03	P	V		1.8E+04	1.36E+09	1.7E+04	1		Nitromethane	75-52-5			5.4E+02	5.4E+02			8.8E+01	8.8E+01
		5.8E-04	X			2.0E-02	I	V		4.9E+03	1.36E+09	1.3E+04	1		Nitropropane, 2-	79-46-9			6.4E+00	6.4E+00			2.7E+02	2.7E+02
2.7E+01	C	7.7E-03	C						M		1.36E+09		1	0.1	Nitroso-N-ethylurea, N-	759-73-9	5.7E-01	2.2E+00	1.8E+04	4.5E-01				
1.2E+02	C	3.4E-02	C						M		1.36E+09		1	0.1	Nitroso-N-methylurea, N-	684-93-5	1.3E-01	5.0E-01	4.1E+03	1.0E-01				
5.4E+00	I	1.6E-03	I					V			1.36E+09	2.4E+05	1		Nitroso-di-N-butylamine, N-	924-16-3	1.3E+01		4.3E+01	9.9E+00				
7.0E+00	I	2.0E-03	C								1.36E+09		1	0.1	Nitroso-di-N-propylamine, N-	621-64-7	9.9E+00	3.5E+01	1.9E+05	7.8E+00				
2.8E+00	I	8.0E-04	C								1.36E+09		1	0.1	Nitrosodiethanolamine, N-	1116-54-7	2.5E+01	8.8E+01	4.8E+05	1.9E+01				
1.5E+02	I	4.3E-02	I						M		1.36E+09		1	0.1	Nitrosodiethylamine, N-	55-18-5	1.0E-01	4.0E-01	3.2E+03	8.1E-02				
5.1E+01	I	1.4E-02	I	8.0E-06	P	4.0E-05	X	V	M	2.4E+05	1.36E+09	8.2E+04	1		Nitrosodimethylamine, N-	62-75-9	3.0E-01		6.0E-01	2.0E-01	6.3E-01		3.4E+00	5.3E-01
4.9E-03	I	2.6E-06	C								1.36E+09		1	0.1	Nitrosodiphenylamine, N-	86-30-6	1.4E+04	5.0E+04	1.5E+08	1.1E+04				
2.2E+01	I	6.3E-03	C					V		1.1E+05	1.36E+09	1.2E+05	1		Nitrosomethylethylamine, N-	10595-95-6	3.2E+00		5.4E+00	2.0E+00				
6.7E+00	C	1.9E-03	C								1.36E+09		1	0.1	Nitrosomorpholine [N-]	59-89-2	1.0E+01	3.7E+01	2.0E+05	8.1E+00				
9.4E+00	C	2.7E-03	C								1.36E+09		1	0.1	Nitrosopiperidine [N-]	100-75-4	7.4E+00	2.6E+01	1.4E+05	5.8E+00				
2.1E+00	I	6.1E-04	I								1.36E+09		1	0.1	Nitrosopyrrolidine, N-	930-55-2	3.3E+01	1.2E+02	6.3E+05	2.6E+01				
				1.0E-04	X						1.36E+09		1	0.1	Nitrotoluene, m-	99-08-1					7.8E+00	3.3E+01		6.3E+00
2.2E-01	P			9.0E-04	P			V		1.5E+03	1.36E+09	1.4E+05	1		Nitrotoluene, o-	88-72-2	3.2E+02			3.2E+02	7.0E+01			7.0E+01
1.6E-02	P			4.0E-03	P						1.36E+09		1	0.1	Nitrotoluene, p-	99-99-0	4.3E+03	1.5E+04		3.4E+03	3.1E+02	1.3E+03		2.5E+02
				3.0E-04	X	2.0E-02	P	V		6.9E+00	1.36E+09	1.0E+03	1		Nonane, n-	111-84-2					2.3E+01		2.2E+01	1.1E+01
				1.5E-02	O						1.36E+09		1	0.1	Norflurazon	27314-13-2					1.2E+03	4.9E+03		9.5E+02
				3.0E-03	I						1.36E+09		1	0.1	Octabromodiphenyl Ether	32536-52-0					2.3E+02	9.9E+02		1.9E+02
				5.0E-02	I						1.36E+09		1	0.006	Octahydro-1,3,5,7-tetranitro-1,3,5,7-tetrazocine (HMX)	2691-41-0					3.9E+03	2.7E+05		3.9E+03
				2.0E-03	H						1.36E+09		1	0.1	Octamethylpyrophosphoramide	152-16-9					1.6E+02	6.6E+02		1.3E+02
7.8E-03	O			1.4E-01	O						1.36E+09		1	0.1	Oryzalin	19044-88-3	8.9E+03	3.2E+04		7.0E+03	1.1E+04	4.6E+04		8.8E+03
				5.0E-03	I						1.36E+09		1	0.1	Oxadiazon	19666-30-9					3.9E+02	1.6E+03		3.2E+02
				2.5E-02	I						1.36E+09		1	0.1	Oxamyl	23135-22-0					2.0E+03	8.2E+03		1.6E+03
7.3E-02	O			3.0E-02	O						1.36E+09		1	0.1	Oxyfluorfen	42874-03-3	9.5E+02	3.4E+03		7.4E+02	2.3E+03	9.9E+03		1.9E+03
				1.3E-02	I						1.36E+09		1	0.1	Paclobutrazol	76738-62-0					1.0E+03	4.3E+03		8.2E+02
				4.5E-03	I						1.36E+09		1	0.1	Paraquat Dichloride	1910-42-5					3.5E+02	1.5E+03		2.8E+02
				6.0E-03	H						1.36E+09		1	0.1	Parathion	56-38-2					4.7E+02	2.0E+03		3.8E+02
				5.0E-02	H			V			1.36E+09	4.5E+04	1		Pebulate	1114-71-2					3.9E+03			3.9E+03
				3.0E-01	O						1.36E+09		1	0.1	Pendimethalin	40487-42-1					2.3E+04	9.9E+04		1.9E+04
				2.0E-03	I			V		3.1E-01	1.36E+09	5.1E+05	1		Pentabromodiphenyl Ether	32534-81-9					1.6E+02			1.6E+02
				1.0E-04	I						1.36E+09		1	0.1	Pentabromodiphenyl ether, 2,2',4,4',5- (BDE-99)	60348-60-9					7.8E+00	3.3E+01		6.3E+00
				8.0E-04	I			V			1.36E+09	8.1E+04	1		Pentachlorobenzene	608-93-5					6.3E+01			6.3E+01
9.0E-02	P							V		4.6E+02	1.36E+09	9.7E+03	1		Pentachloroethane	76-01-7	7.7E+02			7.7E+02				
2.6E-01	H			3.0E-03	I			V			1.36E+09	4.3E+05	1		Pentachloronitrobenzene	82-68-8	2.7E+02			2.7E+02	2.3E+02			2.3E+02
4.0E-01	I	5.1E-06	C	5.0E-03	I						1.36E+09		1	0.25	Pentachlorophenol	87-86-5	1.7E+02	2.5E+02	7.5E+07	1.0E+02	3.9E+02	6.6E+02		2.5E+02
4.0E-03	X			2.0E-03	P						1.36E+09		1	0.1	Pentaerythritol tetranitrate (PETN)	78-11-5	1.7E+04	6.2E+04		1.4E+04	1.6E+02	6.6E+02		1.3E+02
						1.0E+00	P	V		3.9E+02	1.36E+09	7.8E+02	1		Pentane, n-	109-66-0							8.1E+02	8.1E+02

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
														Perchlorates									
				7.0E-04	I						1.36E+09		1		~Ammonium Perchlorate	7790-98-9					5.5E+01			5.5E+01
				7.0E-04	I						1.36E+09		1		~Lithium Perchlorate	7791-03-9					5.5E+01			5.5E+01
				7.0E-04	I						1.36E+09		1		~Perchlorate and Perchlorate Salts	14797-73-0					5.5E+01			5.5E+01
				7.0E-04	I						1.36E+09		1		~Potassium Perchlorate	7778-74-7					5.5E+01			5.5E+01
				7.0E-04	I						1.36E+09		1		~Sodium Perchlorate	7601-89-0					5.5E+01			5.5E+01
				2.0E-02	P						1.36E+09		1	0.1	Perfluorobutane sulfonic acid (PFBS)	375-73-5					1.6E+03	6.6E+03		1.3E+03
				2.0E-02	P						1.36E+09		1	0.1	Perfluorobutanesulfonate	45187-15-3					1.6E+03	6.6E+03		1.3E+03
				5.0E-02	I						1.36E+09		1	0.1	Permethrin	52645-53-1					3.9E+03	1.6E+04		3.2E+03
2.2E-03	C	6.3E-07	C								1.36E+09		1	0.1	Phenacetin	62-44-2	3.2E+04	1.1E+05	6.1E+08	2.5E+04				
				2.4E-01	O						1.36E+09		1	0.1	Phenmedipham	13684-63-4					1.9E+04	7.9E+04		1.5E+04
				3.0E-01	I	2.0E-01	C				1.36E+09		1	0.1	Phenol	108-95-2					2.3E+04	9.9E+04	2.8E+08	1.9E+04
				4.0E-03	I						1.36E+09		1	0.1	Phenol, 2-(1-methylethoxy)-, methylcarbamate	114-26-1					3.1E+02	1.3E+03		2.5E+02
				5.0E-04	X						1.36E+09		1	0.1	Phenothiazine	92-84-2					3.9E+01	1.6E+02		3.2E+01
				2.0E-04	X			V		1.3E+02	1.36E+09	7.1E+03	1		Phenyl Isothiocyanate	103-72-0					1.6E+01			1.6E+01
				6.0E-03	I						1.36E+09		1	0.1	Phenylenediamine, m-	108-45-2					4.7E+02	2.0E+03		3.8E+02
1.2E-01	P			4.0E-03	P						1.36E+09		1	0.1	Phenylenediamine, o-	95-54-5	5.8E+02	2.1E+03		4.5E+02	3.1E+02	1.3E+03		2.5E+02
				1.0E-03	X						1.36E+09		1	0.1	Phenylenediamine, p-	106-50-3					7.8E+01	3.3E+02		6.3E+01
1.9E-03	H										1.36E+09		1	0.1	Phenylphenol, 2-	90-43-7	3.6E+04	1.3E+05		2.8E+04				
				2.0E-04	H						1.36E+09		1	0.1	Phorate	298-02-2					1.6E+01	6.6E+01		1.3E+01
						3.0E-04	I	V		1.6E+03	1.36E+09	9.8E+02	1		Phosgene	75-44-5							3.1E-01	3.1E-01
				2.0E-02	I						1.36E+09		1	0.1	Phosmet	732-11-6					1.6E+03	6.6E+03		1.3E+03
															Phosphates, Inorganic									
				4.9E+01	P						1.36E+09		1		~Aluminum metaphosphate	13776-88-0					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Ammonium polyphosphate	68333-79-9					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Calcium pyrophosphate	7790-76-3					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Diammonium phosphate	7783-28-0					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Dicalcium phosphate	7757-93-9					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Dimagnesium phosphate	7782-75-4					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Dipotassium phosphate	7758-11-4					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Disodium phosphate	7558-79-4					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Monoaluminum phosphate	13530-50-2					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Monoammonium phosphate	7722-76-1					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Monocalcium phosphate	7758-23-8					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Monomagnesium phosphate	7757-86-0					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Monopotassium phosphate	7778-77-0					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Monosodium phosphate	7558-80-7					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Polyphosphoric acid	8017-16-1					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Potassium tripolyphosphate	13845-36-8					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Sodium acid pyrophosphate	7758-16-9					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Sodium aluminum phosphate (acidic)	7785-88-8					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Sodium aluminum phosphate (anhydrous)	10279-59-1					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Sodium aluminum phosphate (tetrahydrate)	10305-76-7					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Sodium hexametaphosphate	10124-56-8					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Sodium polyphosphate	68915-31-1					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Sodium trimetaphosphate	7785-84-4					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Sodium tripolyphosphate	7758-29-4					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Tetrapotassium phosphate	7320-34-5					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Tetrasodium pyrophosphate	7722-88-5					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Trialuminum sodium tetra decahydrogenoctaorthophosphate (dihydrate)	15136-87-5					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Tricalcium phosphate	7758-87-4					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Trimagnesium phosphate	7757-87-1					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Tripotassium phosphate	7778-53-2					3.8E+06			3.8E+06
				4.9E+01	P						1.36E+09		1		~Trisodium phosphate	7601-54-9					3.8E+06			3.8E+06
				3.0E-04	I	3.0E-04	I	V			1.36E+09		1		Phosphine	7803-51-2					2.3E+01		4.3E+05	2.3E+01
				4.9E+01	P	1.0E-02	I				1.36E+09		1		Phosphoric Acid	7664-38-2					3.8E+06		1.4E+07	3.0E+06
				2.0E-05	I			V			1.36E+09	6.9E+03	1		Phosphorus, White	7723-14-0					1.6E+00			1.6E+00
															Phthalates									
1.4E-02	I	2.4E-06	C	2.0E-02	I						1.36E+09		1	0.1	~Bis(2-ethylhexyl)phthalate	117-81-7	5.0E+03	1.8E+04	1.6E+08	3.9E+03	1.6E+03	6.6E+03		1.3E+03
1.9E-03	P			2.0E-01	I						1.36E+09		1	0.1	~Butyl Benzyl Phthalate	85-68-7	3.7E+04	1.3E+05		2.9E+04	1.6E+04	6.6E+04		1.3E+04
				1.0E+00	I						1.36E+09		1	0.1	~Butylphthalyl Butylglycolate	85-70-1					7.8E+04	3.3E+05		6.3E+04
				1.0E-01	I						1.36E+09		1	0.1	~Dibutyl Phthalate	84-74-2					7.8E+03	3.3E+04		6.3E+03
				8.0E-01	I						1.36E+09		1	0.1	~Diethyl Phthalate	84-66-2					6.3E+04	2.6E+05		5.1E+04
				1.0E-01	I			V			1.36E+09	2.1E+04	1		~Dimethylterephthalate	120-61-6					7.8E+03			7.8E+03
				1.0E-02	P						1.36E+09		1	0.1	~Octyl Phthalate, di-N-	117-84-0					7.8E+02	3.3E+03		6.3E+02
				1.0E+00	H						1.36E+09		1	0.1	~Phthalic Acid, P-	100-21-0					7.8E+04	3.3E+05		6.3E+04
				2.0E+00	I	2.0E-02	C				1.36E+09		1	0.1	~Phthalic Anhydride	85-44-9					1.6E+05	6.6E+05	2.8E+07	1.3E+05
				7.0E-02	I						1.36E+09		1	0.1	Picloram	1918-02-1					5.5E+03	2.3E+04		4.4E+03
				1.0E-04	X						1.36E+09		1	0.1	Picramic Acid (2-Amino-4,6-dinitrophenol)	96-91-3					7.8E+00	3.3E+01		6.3E+00
				9.0E-04	X						1.36E+09		1	0.1	Picric Acid (2,4,6-Trinitrophenol)	88-89-1					7.0E+01	3.0E+02		5.7E+01
				7.0E-05	O						1.36E+09		1	0.1	Pirimiphos, Methyl	29232-93-7					5.5E+00	2.3E+01		4.4E+00
3.0E+01	C	8.6E-03	C	7.0E-06	H						1.36E+09		1	0.1	Polybrominated Biphenyls	36355-01-8	2.3E+00	8.2E+00	4.4E+04	1.8E+00	5.5E-01	2.3E+00		4.4E-01
															Polychlorinated Biphenyls (PCBs)									
7.0E-02	G	2.0E-05	G	7.0E-05	I			V			1.36E+09	5.9E+05	1	0.14	~Aroclor 1016	12674-11-2	9.9E+02	2.5E+03	8.2E+03	6.6E+02	5.5E+00	1.6E+01		4.1E+00
2.0E+00	G	5.7E-04	G					V			1.36E+09	2.0E+05	1	0.14	~Aroclor 1221	11104-28-2	3.5E+01	8.8E+01	1.0E+02	2.0E+01				
2.0E+00	G	5.7E-04	G					V			1.36E+09	1.1E+05	1	0.14	~Aroclor 1232	11141-16-5	3.5E+01	8.8E+01	5.5E+01	1.7E+01				
2.0E+00	G	5.7E-04	G					V			1.36E+09	5.9E+05	1	0.14	~Aroclor 1242	53469-21-9	3.5E+01	8.8E+01	2.9E+02	2.3E+01				
2.0E+00	G	5.7E-04	G					V			1.36E+09	5.1E+05	1	0.14	~Aroclor 1248	12672-29-6	3.5E+01	8.8E+01	2.5E+02	2.3E+01				
2.0E+00	G	5.7E-04	G	2.0E-05	I			V			1.36E+09	8.4E+05	1	0.14	~Aroclor 1254	11097-69-1	3.5E+01	8.8E+01	4.1E+02	2.4E+01	1.6E+00	4.7E+00		1.2E+00

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information																Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
2.0E+00	G	5.7E-04	G					V			1.36E+09	1.3E+06	1	0.14	~Aroclor 1260	11096-82-5	3.5E+01	8.8E+01	6.5E+02	2.4E+01				
				6.0E-04	X			V			1.36E+09	1.2E+06	1	0.14	~Aroclor 5460	11126-42-4					4.7E+01	1.4E+02		3.5E+01
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.36E+09	2.4E+06	1	0.14	~Heptachlorobiphenyl, 2,3,3',4,4',5,5'- (PCB 189)	39635-31-9	1.8E+01	4.5E+01	6.0E+02	1.3E+01	1.8E+00	5.5E+00	3.4E+03	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.36E+09	1.6E+06	1	0.14	~Hexachlorobiphenyl, 2,3',4,4',5,5'- (PCB 167)	52663-72-6	1.8E+01	4.5E+01	3.9E+02	1.2E+01	1.8E+00	5.5E+00	2.2E+03	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.36E+09	1.0E+06	1	0.14	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 157)	69782-90-7	1.8E+01	4.5E+01	2.6E+02	1.2E+01	1.8E+00	5.5E+00	1.4E+03	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.36E+09	1.1E+06	1	0.14	~Hexachlorobiphenyl, 2,3,3',4,4',5- (PCB 156)	38380-08-4	1.8E+01	4.5E+01	2.7E+02	1.2E+01	1.8E+00	5.5E+00	1.5E+03	1.4E+00
3.9E+03	W	1.1E+00	W	2.3E-08	W	1.3E-06	W	V			1.36E+09	1.6E+06	1	0.14	~Hexachlorobiphenyl, 3,3',4,4',5,5'- (PCB 169)	32774-16-6	1.8E-02	4.5E-02	3.9E-01	1.2E-02	1.8E-03	5.5E-03	2.2E+00	1.4E-03
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.36E+09	7.3E+05	1	0.14	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 123)	65510-44-3	1.8E+01	4.5E+01	1.8E+02	1.2E+01	1.8E+00	5.5E+00	1.0E+03	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.36E+09	5.9E+05	1	0.14	~Pentachlorobiphenyl, 2,3',4,4',5- (PCB 118)	31508-00-6	1.8E+01	4.5E+01	1.5E+02	1.2E+01	1.8E+00	5.5E+00	8.2E+02	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.36E+09	6.0E+05	1	0.14	~Pentachlorobiphenyl, 2,3,3',4,4'- (PCB 105)	32598-14-4	1.8E+01	4.5E+01	1.5E+02	1.2E+01	1.8E+00	5.5E+00	8.4E+02	1.4E+00
3.9E+00	W	1.1E-03	W	2.3E-05	W	1.3E-03	W	V			1.36E+09	1.1E+06	1	0.14	~Pentachlorobiphenyl, 2,3,4,4',5- (PCB 114)	74472-37-0	1.8E+01	4.5E+01	2.6E+02	1.2E+01	1.8E+00	5.5E+00	1.5E+03	1.4E+00
1.3E+04	W	3.8E+00	W	7.0E-09	W	4.0E-07	W	V			1.36E+09	7.3E+05	1	0.14	~Pentachlorobiphenyl, 3,3',4,4',5- (PCB 126)	57465-28-8	5.3E-03	1.4E-02	5.4E-02	3.6E-03	5.5E-04	1.6E-03	3.0E-01	4.1E-04
2.0E+00	I	5.7E-04	I					V			1.36E+09	5.3E+05	1	0.14	~Polychlorinated Biphenyls (high risk)	1336-36-3	3.5E+01	8.8E+01	2.6E+02	2.3E+01				
4.0E-01	I	1.0E-04	I					V					1	0.14	~Polychlorinated Biphenyls (low risk)	1336-36-3								
7.0E-02	I	2.0E-05	I					V					1	0.14	~Polychlorinated Biphenyls (lowest risk)	1336-36-3								
1.3E+01	W	3.8E-03	W	7.0E-06	W	4.0E-04	W				1.36E+09		1	0.14	~Tetrachlorobiphenyl, 3,3',4,4'- (PCB 77)	32598-13-3	5.3E+00	1.4E+01	1.0E+05	3.8E+00	5.5E-01	1.6E+00	5.7E+05	4.1E-01
3.9E+01	W	1.1E-02	W	2.3E-06	W	1.3E-04	W	V			1.36E+09	5.1E+05	1	0.14	~Tetrachlorobiphenyl, 3,4,4',5- (PCB 81)	70362-50-4	1.8E+00	4.5E+00	1.3E+01	1.2E+00	1.8E-01	5.5E-01	7.1E+01	1.4E-01
						6.0E-04	I				1.36E+09		1	0.1	Polymeric Methylene Diphenyl Diisocyanate (PMDI)	9016-87-9							8.5E+05	8.5E+05
															Polynuclear Aromatic Hydrocarbons (PAHs)									
				6.0E-02	I			V			1.36E+09	1.4E+05	1	0.13	~Acenaphthene	83-32-9					4.7E+03	1.5E+04		3.6E+03
				3.0E-01	I			V			1.36E+09	5.2E+05	1	0.13	~Anthracene	120-12-7					2.3E+04	7.6E+04		1.8E+04
1.0E-01	E	6.0E-05	E					V	M		1.36E+09	4.4E+06	1	0.13	~Benz[a]anthracene	56-55-3	1.5E+02	4.6E+02	7.4E+03	1.1E+02				
1.2E+00	C	1.1E-04	C								1.36E+09		1	0.13	~Benzo(j)fluoranthene	205-82-3	5.8E+01	1.6E+02	3.5E+06	4.2E+01				
1.0E+00	I	6.0E-04	I	3.0E-04	I	2.0E-06	I		M		1.36E+09		1	0.13	~Benzo[a]pyrene	50-32-8	1.5E+01	4.6E+01	2.3E+05	1.1E+01	2.3E+01	7.6E+01	2.8E+03	1.8E+01
1.0E-01	E	6.0E-05	E						M		1.36E+09		1	0.13	~Benzo[b]fluoranthene	205-99-2	1.5E+02	4.6E+02	2.3E+06	1.1E+02				
1.0E-02	E	6.0E-06	E						M		1.36E+09		1	0.13	~Benzo[k]fluoranthene	207-08-9	1.5E+03	4.6E+03	2.3E+07	1.1E+03				
				8.0E-02	I			V			1.36E+09	8.0E+04	1	0.13	~Chloronaphthalene, Beta-	91-58-7					6.3E+03	2.0E+04		4.8E+03
1.0E-03	E	6.0E-07	E						M		1.36E+09		1	0.13	~Chrysene	218-01-9	1.5E+04	4.6E+04	2.3E+08	1.1E+04				
1.0E+00	E	6.0E-04	E						M		1.36E+09		1	0.13	~Dibenz[a,h]anthracene	53-70-3	1.5E+01	4.6E+01	2.3E+05	1.1E+01				
1.2E+01	C	1.1E-03	C								1.36E+09		1	0.13	~Dibenzo(a,e)pyrene	192-65-4	5.8E+00	1.6E+01	3.5E+05	4.2E+00				
2.5E+02	C	7.1E-02	C						M		1.36E+09		1	0.13	~Dimethylbenz(a)anthracene, 7,12-	57-97-6	6.1E-02	1.8E-01	1.9E+03	4.6E-02				
				4.0E-02	I						1.36E+09		1	0.13	~Fluoranthene	206-44-0					3.1E+03	1.0E+04		2.4E+03
				4.0E-02	I			V			1.36E+09	2.8E+05	1	0.13	~Fluorene	86-73-7					3.1E+03	1.0E+04		2.4E+03
1.0E-01	E	6.0E-05	E						M		1.36E+09		1	0.13	~Indeno[1,2,3-cd]pyrene	193-39-5	1.5E+02	4.6E+02	2.3E+06	1.1E+02				
2.9E-02	P			7.0E-02	A			V		3.9E+02	1.36E+09	5.9E+04	1	0.13	~Methylnaphthalene, 1-	90-12-0	2.4E+03	6.6E+03		1.8E+03	5.5E+03	1.8E+04		4.2E+03
				4.0E-03	I			V			1.36E+09	5.8E+04	1	0.13	~Methylnaphthalene, 2-	91-57-6					3.1E+02	1.0E+03		2.4E+02
1.2E-01	C	3.4E-05	C	2.0E-02	I	3.0E-03	I	V			1.36E+09	4.6E+04	1	0.13	~Naphthalene	91-20-3	5.8E+02	1.6E+03	3.8E+02	2.0E+02	1.6E+03	5.1E+03	1.4E+02	1.3E+02
1.2E+00	C	1.1E-04	C								1.36E+09		1	0.13	~Nitropyrene, 4-	57835-92-4	5.8E+01	1.6E+02	3.5E+06	4.2E+01				
				3.0E-02	I			V			1.36E+09	2.4E+06	1	0.13	~Pyrene	129-00-0					2.3E+03	7.6E+03		1.8E+03
				2.0E-02	P						1.36E+09		1	0.1	Potassium Perfluorobutane Sulfonate	29420-49-3					1.6E+03	6.6E+03		1.3E+03
1.5E-01	I			9.0E-03	I						1.36E+09		1	0.1	Prochloraz	67747-09-5	4.6E+02	1.6E+03		3.6E+02	7.0E+02	3.0E+03		5.7E+02
				6.0E-03	H			V			1.36E+09	4.2E+05	1		Profluralin	26399-36-0					4.7E+02			4.7E+02
				1.5E-02	I						1.36E+09		1	0.1	Prometon	1610-18-0					1.2E+03	4.9E+03		9.5E+02
				4.0E-02	O						1.36E+09		1	0.1	Prometryn	7287-19-6					3.1E+03	1.3E+04		2.5E+03
				7.5E-02	I						1.36E+09		1	0.1	Pronamide	23950-58-5					5.9E+03	2.5E+04		4.7E+03
				1.3E-02	I						1.36E+09		1	0.1	Propachlor	1918-16-7					1.0E+03	4.3E+03		8.2E+02
				5.0E-03	I						1.36E+09		1	0.1	Propanil	709-98-8					3.9E+02	1.6E+03		3.2E+02
1.9E-01	O			4.0E-02	O						1.36E+09		1	0.1	Propargite	2312-35-8	3.6E+02	1.3E+03		2.8E+02	3.1E+03	1.3E+04		2.5E+03
				2.0E-03	I			V		1.1E+05	1.36E+09	6.3E+04	1		Propargyl Alcohol	107-19-7					1.6E+02			1.6E+02
				2.0E-02	I						1.36E+09		1	0.1	Propazine	139-40-2					1.6E+03	6.6E+03		1.3E+03
				2.0E-02	I						1.36E+09		1	0.1	Propham	122-42-9					1.6E+03	6.6E+03		1.3E+03
				1.0E-01	O						1.36E+09		1	0.1	Propiconazole	60207-90-1					7.8E+03	3.3E+04		6.3E+03
						8.0E-03	I	V		3.3E+04	1.36E+09	8.9E+03	1		Propionaldehyde	123-38-6							7.5E+01	7.5E+01
				1.0E-01	X	1.0E+00	X	V		2.6E+02	1.36E+09	7.0E+03	1		Propyl benzene	103-65-1					7.8E+03		7.3E+03	3.8E+03
						3.0E+00	C	V		3.5E+02	1.36E+09	7.0E+02	1		Propylene	115-07-1							2.2E+03	2.2E+03
				2.0E+01	P						1.36E+09		1	0.1	Propylene Glycol	57-55-6					1.6E+06	6.6E+06		1.3E+06
						2.7E-04	A				1.36E+09		1	0.1	Propylene Glycol Dinitrate	6423-43-4							3.9E+05	3.9E+05
				7.0E-01	H	2.0E+00	I	V		1.1E+05	1.36E+09	7.8E+04	1		Propylene Glycol Monomethyl Ether	107-98-2					5.5E+04		1.6E+05	4.1E+04
2.4E-01	I	3.7E-06	I			3.0E-02	I	V		7.8E+04	1.36E+09	1.0E+04	1		Propylene Oxide	75-56-9	2.9E+02		7.8E+02	2.1E+02			3.2E+02	3.2E+02
				1.0E-03	I			V		5.3E+05	1.36E+09	5.5E+04	1		Pyridine	110-86-1					7.8E+01			7.8E+01
				5.0E-04	I						1.36E+09		1	0.1	Quinalphos	13593-03-8					3.9E+01	1.6E+02		3.2E+01
3.0E+00	I										1.36E+09		1	0.1	Quinoline	91-22-5	2.3E+01	8.2E+01		1.8E+01				
				9.0E-03	I						1.36E+09		1	0.1	Quizalofop-ethyl	76578-14-8					7.0E+02	3.0E+03		5.7E+02
						3.0E+04	A						1		Refractory Ceramic Fibers (units in fibers)	E715557								
				3.0E-02	I						1.36E+09		1	0.1	Resmethrin	10453-86-8					2.3E+03	9.9E+03		1.9E+03
				5.0E-02	H			V			1.36E+09	4.7E+05	1		Ronnel	299-84-3					3.9E+03			3.9E+03
				4.0E-03	I						1.36E+09		1	0.1	Rotenone	83-79-4					3.1E+02	1.3E+03		2.5E+02
2.2E-01	C	6.3E-05	C						M		1.36E+09		1	0.1	Safrole	94-59-7	7.0E+01	2.7E+02	2.2E+06	5.5E+01				
				5.0E-03	I						1.36E+09		1		Selenious Acid	7783-00-8					3.9E+02			3.9E+02
				5.0E-03	I	2.0E-02	C				1.36E+09		1		Selenium	7782-49-2					3.9E+02		2.8E+07	3.9E+02
				5.0E-03	C	2.0E-02	C				1.36E+09		1		Selenium Sulfide	7446-34-6					3.9E+02		2.8E+07	3.9E+02
				1.4E-01	O						1.36E+09		1	0.1	Sethoxydim	74051-80-2					1.1E+04	4.6E+04		8.8E+03
						3.0E-03	C				1.36E+09		1		Silica (crystalline, respirable)	7631-86-9							4.3E+06	4.3E+06
				5.0E-03	I						1.36E+09			0.04	Silver	7440-22-4					3.9E+02			3.9E+02
1.2E-01	H			5.0E-03	I						1.36E+09		1	0.1	Simazine	122-34-9	5.8E+02	2.1E+03		4.5E+02	3.9E+02	1.6E+03		3.2E+02
				1.3E-02	I						1.36E+09		1	0.1	Sodium Acifluorfen	62476-59-9					1.0E+03	4.3E+03		8.2E+02
				4.0E-03	I						1.36E+09		1		Sodium Azide	26628-22-8					3.1E+02			3.1E+02
2.7E-01	H			3.0E-02	I						1.36E+09		1	0.1	Sodium Diethyldithiocarbamate	148-18-5	2.6E+02	9.2E+02		2.0E+02	2.3E+03	9.9E+03		1.9E+03
				5.0E-02	A	1.3E-02	C				1.36E+09		1		Sodium Fluoride	7681-49-4					3.9E+03		1.8E+07	3.9E+03

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information															Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
				2.0E-05	I						1.36E+09		1	0.1	Sodium Fluoroacetate	62-74-8					1.6E+00	6.6E+00		1.3E+00
				1.0E-03	H						1.36E+09		1		Sodium Metavanadate	13718-26-8					7.8E+01			7.8E+01
				8.0E-04	P						1.36E+09		1		Sodium Tungstate	13472-45-2					6.3E+01			6.3E+01
				8.0E-04	P						1.36E+09		1		Sodium Tungstate Dihydrate	10213-10-2					6.3E+01			6.3E+01
2.4E-02	H			3.0E-02	I						1.36E+09		1	0.1	Stirofos (Tetrachlorovinphos)	961-11-5	2.9E+03	1.0E+04		2.3E+03	2.3E+03	9.9E+03		1.9E+03
				6.0E-01	I						1.36E+09		1		Strontium, Stable	7440-24-6					4.7E+04			4.7E+04
				3.0E-04	I						1.36E+09		1	0.1	Strychnine	57-24-9					2.3E+01	9.9E+01		1.9E+01
				2.0E-01	I	1.0E+00	I	V		8.7E+02	1.36E+09	9.4E+03	1		Styrene	100-42-5					1.6E+04		9.7E+03	6.0E+03
				3.0E-03	P						1.36E+09		1	0.1	Styrene-Acrylonitrile (SAN) Trimer (*THNA isomer*)	57964-39-3					2.3E+02	9.9E+02		1.9E+02
				3.0E-03	P						1.36E+09		1	0.1	Styrene-Acrylonitrile (SAN) Trimer (THNP isomer)	57964-40-6					2.3E+02	9.9E+02		1.9E+02
				1.0E-03	P	2.0E-03	X				1.36E+09		1	0.1	Sulfolane	126-33-0					7.8E+01	3.3E+02	2.8E+06	6.3E+01
				8.0E-04	P						1.36E+09		1	0.1	Sulfonylbis(4-chlorobenzene), 1,1'-	80-07-9					6.3E+01	2.6E+02		5.1E+01
						1.0E-03	C	V			1.36E+09		1		Sulfur Trioxide	7446-11-9							1.4E+06	1.4E+06
						1.0E-03	C				1.36E+09		1		Sulfuric Acid	7664-93-9							1.4E+06	1.4E+06
2.5E-02	I	7.1E-06	I	5.0E-02	H						1.36E+09		1	0.1	Sulfurous acid, 2-chloroethyl 2-[4-(1,1-dimethylethyl)phenoxy]-1-methylethyl es	140-57-8	2.8E+03	9.9E+03	5.4E+07	2.2E+03	3.9E+03	1.6E+04		3.2E+03
				3.0E-02	H						1.36E+09		1	0.1	TCMTB	21564-17-0					2.3E+03	9.9E+03		1.9E+03
				7.0E-02	I						1.36E+09		1	0.1	Tebuthiuron	34014-18-1					5.5E+03	2.3E+04		4.4E+03
				2.0E-02	H						1.36E+09		1	0.1	Temephos	3383-96-8					1.6E+03	6.6E+03		1.3E+03
				1.3E-02	I						1.36E+09		1	0.1	Terbacil	5902-51-2					1.0E+03	4.3E+03		8.2E+02
				2.5E-05	H			V		3.1E+01	1.36E+09	2.6E+05	1		Terbufos	13071-79-9					2.0E+00			2.0E+00
				1.0E-03	I						1.36E+09		1	0.1	Terbutryn	886-50-0					7.8E+01	3.3E+02		6.3E+01
5.0E-03	C	1.3E-06	C					V			1.36E+09	4.0E+03	1		Tert-Butyl Acetate	540-88-5	1.4E+04		8.6E+02	8.1E+02				
				1.0E-04	I						1.36E+09		1	0.1	Tetrabromodiphenyl ether, 2,2',4,4'- (BDE-47)	5436-43-1					7.8E+00	3.3E+01		6.3E+00
				3.0E-04	I			V			1.36E+09	5.1E+04	1		Tetrachlorobenzene, 1,2,4,5-	95-94-3					2.3E+01			2.3E+01
2.6E-02	I	7.4E-06	I	3.0E-02	I			V		6.8E+02	1.36E+09	5.7E+03	1		Tetrachloroethane, 1,1,1,2-	630-20-6	2.7E+03		2.2E+02	2.0E+02	2.3E+03			2.3E+03
2.0E-01	I	5.8E-05	C	2.0E-02	I			V		1.9E+03	1.36E+09	1.5E+04	1		Tetrachloroethane, 1,1,2,2-	79-34-5	3.5E+02		7.3E+01	6.0E+01	1.6E+03			1.6E+03
2.1E-03	I	2.6E-07	I	6.0E-03	I	4.0E-02	I	V		1.7E+02	1.36E+09	2.4E+03	1		Tetrachloroethylene	127-18-4	3.3E+04		2.5E+03	2.4E+03	4.7E+02		9.8E+01	8.1E+01
				3.0E-02	I						1.36E+09		1	0.1	Tetrachlorophenol, 2,3,4,6-	58-90-2					2.3E+03	9.9E+03		1.9E+03
1.6E+01	X			6.0E-05	X			V			1.36E+09	1.1E+05	1		Tetrachlorotoluene, p- alpha, alpha, alpha-	5216-25-1	4.3E+00			4.3E+00	4.7E+00			4.7E+00
				5.0E-04	I						1.36E+09		1	0.1	Tetraethyl Dithiopyrophosphate	3689-24-5					3.9E+01	1.6E+02		3.2E+01
						8.0E+01	I	V		2.1E+03	1.36E+09	1.2E+03	1		Tetrafluoroethane, 1,1,1,2-	811-97-2							1.0E+05	1.0E+05
				2.0E-03	P						1.36E+09		1	0.00065	Tetryl (Trinitrophenylmethylnitramine)	479-45-8					1.6E+02	1.0E+05		1.6E+02
				2.0E-05	G						1.36E+09		1		Thallic Oxide	1314-32-5					1.6E+00			1.6E+00
				1.0E-05	X						1.36E+09		1		Thallium (I) Nitrate	10102-45-1					7.8E-01			7.8E-01
				1.0E-05	X						1.36E+09		1		Thallium (Soluble Salts)	7440-28-0					7.8E-01			7.8E-01
				1.0E-05	X			V			1.36E+09		1		Thallium Acetate	563-68-8					7.8E-01			7.8E-01
				2.0E-05	X			V			1.36E+09		1		Thallium Carbonate	6533-73-9					1.6E+00			1.6E+00
				1.0E-05	X						1.36E+09		1		Thallium Chloride	7791-12-0					7.8E-01			7.8E-01
				1.0E-05	G						1.36E+09		1		Thallium Selenite	12039-52-0					7.8E-01			7.8E-01
				2.0E-05	X						1.36E+09		1		Thallium Sulfate	7446-18-6					1.6E+00			1.6E+00
				4.3E-02	O						1.36E+09		1	0.1	Thifensulfuron-methyl	79277-27-3					3.4E+03	1.4E+04		2.7E+03
				1.0E-02	I						1.36E+09		1	0.1	Thiobencarb	28249-77-6					7.8E+02	3.3E+03		6.3E+02
				7.0E-02	X						1.36E+09		1	0.0075	Thiodiglycol	111-48-8					5.5E+03	3.1E+05		5.4E+03
				3.0E-04	H						1.36E+09		1	0.1	Thiofanox	39196-18-4					2.3E+01	9.9E+01		1.9E+01
1.2E-02	O			2.7E-02	O						1.36E+09		1	0.1	Thiophanate, Methyl	23564-05-8	6.0E+03	2.1E+04		4.7E+03	2.1E+03	8.9E+03		1.7E+03
				1.5E-02	O						1.36E+09		1	0.1	Thiram	137-26-8					1.2E+03	4.9E+03		9.5E+02
				6.0E-01	H						1.36E+09		1		Tin	7440-31-5					4.7E+04			4.7E+04
						1.0E-04	A	V			1.36E+09		1		Titanium Tetrachloride	7550-45-0							1.4E+05	1.4E+05
				8.0E-02	I	5.0E+00	I	V		8.2E+02	1.36E+09	4.3E+03	1		Toluene	108-88-3					6.3E+03		2.2E+04	4.9E+03
3.9E-02	C	1.1E-05	C			8.0E-06	C	V			1.36E+09	7.6E+05	1		Toluene-2,4-diisocyanate	584-84-9	1.8E+03		1.9E+04	1.6E+03			6.4E+00	6.4E+00
1.8E-01	X			2.0E-04	X						1.36E+09		1	0.1	Toluene-2,5-diamine	95-70-5	3.9E+02	1.4E+03		3.0E+02	1.6E+01	6.6E+01		1.3E+01
3.9E-02	C	1.1E-05	C			8.0E-06	C	V		1.7E+03	1.36E+09	6.3E+05	1		Toluene-2,6-diisocyanate	91-08-7	1.8E+03		1.6E+04	1.6E+03			5.3E+00	5.3E+00
				5.0E-03	P						1.36E+09		1	0.1	Toluic Acid, p-	99-94-5					3.9E+02	1.6E+03		3.2E+02
1.6E-02	P	5.1E-05	C								1.36E+09		1	0.1	Toluidine, o- (Methylaniline, 2-)	95-53-4	4.3E+03	1.5E+04	7.5E+06	3.4E+03				
3.0E-02	P			4.0E-03	X						1.36E+09		1	0.1	Toluidine, p-	106-49-0	2.3E+03	8.2E+03		1.8E+03	3.1E+02	1.3E+03		2.5E+02
				3.0E+00	P			V		3.4E-01	1.36E+09	1.4E+03	1		Total Petroleum Hydrocarbons (Aliphatic High)	E1790670					2.3E+05			2.3E+05
						6.0E-01	P	V		1.4E+02	1.36E+09	8.3E+02	1		Total Petroleum Hydrocarbons (Aliphatic Low)	E1790666							5.2E+02	5.2E+02
				1.0E-02	X	1.0E-01	P	V		6.9E+00	1.36E+09	1.0E+03	1		Total Petroleum Hydrocarbons (Aliphatic Medium)	E1790668					7.8E+02		1.1E+02	9.6E+01
				4.0E-02	P						1.36E+09		1	0.13	Total Petroleum Hydrocarbons (Aromatic High)	E1790676					3.1E+03	1.0E+04		2.4E+03
				4.0E-03	P	3.0E-02	P	V		1.8E+03	1.36E+09	3.5E+03	1		Total Petroleum Hydrocarbons (Aromatic Low)	E1790672					3.1E+02		1.1E+02	8.2E+01
				4.0E-03	P	3.0E-03	P	V			1.36E+09	5.2E+04	1	0.13	Total Petroleum Hydrocarbons (Aromatic Medium)	E1790674					3.1E+02	1.0E+03	1.6E+02	9.7E+01
1.1E+00	I	3.2E-04	I	9.0E-05	P						1.36E+09		1	0.1	Toxaphene	8001-35-2	6.3E+01	2.2E+02	1.2E+06	4.9E+01	7.0E+00	3.0E+01		5.7E+00
				3.0E-05	X						1.36E+09		1	0.1	Toxaphene, Weathered	E1841606					2.3E+00	9.9E+00		1.9E+00
				7.5E-03	I						1.36E+09		1	0.1	Tralomethrin	66841-25-6					5.9E+02	2.5E+03		4.7E+02
				3.0E-04	A			V			1.36E+09	3.4E+03	1		Tri-n-butyltin	688-73-3					2.3E+01			2.3E+01
				8.0E+01	X						1.36E+09		1	0.1	Triacetin	102-76-1					6.3E+06	2.6E+07		5.1E+06
				3.4E-02	O						1.36E+09		1	0.1	Triadimefon	43121-43-3					2.7E+03	1.1E+04		2.1E+03
7.2E-02	O			2.5E-02	O			V			1.36E+09	3.6E+05	1		Triallate	2303-17-5	9.7E+02			9.7E+02	2.0E+03			2.0E+03
				1.0E-02	I						1.36E+09		1	0.1	Triasulfuron	82097-50-5					7.8E+02	3.3E+03		6.3E+02
				8.0E-03	I						1.36E+09		1	0.1	Tribenuron-methyl	101200-48-0					6.3E+02	2.6E+03		5.1E+02
				5.0E-03	I			V			1.36E+09	4.8E+04	1		Tribromobenzene, 1,2,4-	615-54-3					3.9E+02			3.9E+02
				9.0E-03	X						1.36E+09		1	0.1	Tribromophenol, 2,4,6-	118-79-6					7.0E+02	3.0E+03		5.7E+02
9.0E-03	P			1.0E-02	P						1.36E+09		1	0.1	Tributyl Phosphate	126-73-8	7.7E+03	2.7E+04		6.0E+03	7.8E+02	3.3E+03		6.3E+02
				3.0E-04	P						1.36E+09		1	0.1	Tributyltin Compounds	E1790678					2.3E+01	9.9E+01		1.9E+01
				3.0E-04	I						1.36E+09		1	0.1	Tributyltin Oxide	56-35-9					2.3E+01	9.9E+01		1.9E+01
											1.36E+09				Trichloramine	10025-85-1								
				3.0E+01	I	5.0E+00	P	V		9.1E+02	1.36E+09	1.3E+03	1		Trichloro-1,2,2-trifluoroethane, 1,1,2-	76-13-1					2.3E+06		6.7E+03	6.7E+03
7.0E-02	I			2.0E-02	I						1.36E+09		1	0.1	Trichloroacetic Acid	76-03-9	9.9E+02	3.5E+03		7.8E+02	1.6E+03	6.6E+03		1.3E+03
2.9E-02	H										1.36E+09		1	0.1	Trichloroaniline HCl, 2,4,6-	33663-50-2	2.4E+03	8.5E+03		1.9E+03				

Key: I = IRIS; P = PPRTV; O = OPP; A = ATSDR; C = Cal EPA; X = PPRTV Screening Level; H = HEAST; W = TEF applied; E = RPF applied; G = user's guide Section 5; M = mutagen; V = volatile; R = RBA applied ; c = cancer; n = noncancer; * = where: n SL < 100X c SL; ** = where n SL < 10X c SL; SSL values are based on DAF=1; m = ceiling limit exceeded; s = Csat exceeded.

Toxicity and Chemical-specific Information														Contaminant		Carcinogenic Target Risk (TR) = 1E-04				Noncancer Child Hazard Index (HI) = 1			
SFO (mg/kg-day)$^{-1}$	key	IUR (ug/m^3)$^{-1}$	key	RfD_o (mg/kg-day)	key	RfC_i (mg/m^3)	key	vol	mutagen	C_{sat} (mg/kg)	PEF (m^3/kg)	VF (m^3/kg)	GIABS	ABS_d	Analyte	CAS No.	Ingestion SL TR=1E-04 (mg/kg)	Dermal SL TR=1E-04 (mg/kg)	Inhalation SL TR=1E-04 (mg/kg)	Carcinogenic SL TR=1E-04 (mg/kg)	Ingestion SL Child THQ=1 (mg/kg)	Dermal SL Child THQ=1 (mg/kg)	Inhalation SL Child THQ=1 (mg/kg)	Noncarcinogenic SL Child THI=1 (mg/kg)
7.0E-03	X			3.0E-05	X						1.36E+09		1	0.1	Trichloroaniline, 2,4,6-	634-93-5	9.9E+03	3.5E+04		7.8E+03	2.3E+00	9.9E+00		1.9E+00
				8.0E-04	X			V			1.36E+09	3.2E+04	1		Trichlorobenzene, 1,2,3-	87-61-6					6.3E+01			6.3E+01
2.9E-02	P			1.0E-02	I	2.0E-03	P	V		4.0E+02	1.36E+09	3.0E+04	1		Trichlorobenzene, 1,2,4-	120-82-1	2.4E+03			2.4E+03	7.8E+02		6.2E+01	5.8E+01
				2.0E+00	I	5.0E+00	I	V		6.4E+02	1.36E+09	1.7E+03	1		Trichloroethane, 1,1,1-	71-55-6					1.6E+05		8.6E+03	8.1E+03
5.7E-02	I	1.6E-05	I	4.0E-03	I	2.0E-04	X	V		2.2E+03	1.36E+09	7.2E+03	1		Trichloroethane, 1,1,2-	79-00-5	1.2E+03		1.3E+02	1.1E+02	3.1E+02		1.5E+00	1.5E+00
4.6E-02	I	4.1E-06	I	5.0E-04	I	2.0E-03	I	V	M	6.9E+02	1.36E+09	2.2E+03	1		Trichloroethylene	79-01-6	8.8E+02		1.1E+02	9.4E+01	3.9E+01		4.6E+00	4.1E+00
				3.0E-01	I			V		1.2E+03	1.36E+09	1.0E+03	1		Trichlorofluoromethane	75-69-4					2.3E+04			2.3E+04
				1.0E-01	I						1.36E+09		1	0.1	Trichlorophenol, 2,4,5-	95-95-4					7.8E+03	3.3E+04		6.3E+03
1.1E-02	I	3.1E-06	I	1.0E-03	P						1.36E+09		1	0.1	Trichlorophenol, 2,4,6-	88-06-2	6.3E+03	2.2E+04	1.2E+08	4.9E+03	7.8E+01	3.3E+02		6.3E+01
				1.0E-02	I						1.36E+09		1	0.1	Trichlorophenoxyacetic Acid, 2,4,5-	93-76-5					7.8E+02	3.3E+03		6.3E+02
				8.0E-03	I						1.36E+09		1	0.1	Trichlorophenoxypropionic acid, -2,4,5	93-72-1					6.3E+02	2.6E+03		5.1E+02
				5.0E-03	I			V		1.3E+03	1.36E+09	1.5E+04	1		Trichloropropane, 1,1,2-	598-77-6					3.9E+02			3.9E+02
3.0E+01	I			4.0E-03	I	3.0E-04	I	V	M	1.4E+03	1.36E+09	1.6E+04	1		Trichloropropane, 1,2,3-	96-18-4	5.1E-01			5.1E-01	3.1E+02		4.9E+00	4.8E+00
				3.0E-03	X	3.0E-04	P	V		3.1E+02	1.36E+09	2.3E+03	1		Trichloropropene, 1,2,3-	96-19-5					2.3E+02		7.3E-01	7.3E-01
				2.0E-02	A						1.36E+09		1	0.1	Tricresyl Phosphate (TCP)	1330-78-5					1.6E+03	6.6E+03		1.3E+03
				3.0E-03	I						1.36E+09		1	0.1	Tridiphane	58138-08-2					2.3E+02	9.9E+02		1.9E+02
						7.0E-03	I	V		2.8E+04	1.36E+09	1.6E+04	1		Triethylamine	121-44-8							1.2E+02	1.2E+02
				2.0E+00	P						1.36E+09		1	0.1	Triethylene Glycol	112-27-6					1.6E+05	6.6E+05		1.3E+05
						2.0E+01	P	V		4.8E+03	1.36E+09	7.1E+02	1		Trifluoroethane, 1,1,1-	420-46-2							1.5E+04	1.5E+04
7.7E-03	I			7.5E-03	I			V			1.36E+09	5.1E+05	1		Trifluralin	1582-09-8	9.0E+03			9.0E+03	5.9E+02			5.9E+02
2.0E-02	P			1.0E-02	P						1.36E+09		1	0.1	Trimethyl Phosphate	512-56-1	3.5E+03	1.2E+04		2.7E+03	7.8E+02	3.3E+03		6.3E+02
				1.0E-02	I	6.0E-02	I	V		2.9E+02	1.36E+09	9.4E+03	1		Trimethylbenzene, 1,2,3-	526-73-8					7.8E+02		5.9E+02	3.4E+02
				1.0E-02	I	6.0E-02	I	V		2.2E+02	1.36E+09	7.9E+03	1		Trimethylbenzene, 1,2,4-	95-63-6					7.8E+02		5.0E+02	3.0E+02
				1.0E-02	I	6.0E-02	I	V		1.8E+02	1.36E+09	6.6E+03	1		Trimethylbenzene, 1,3,5-	108-67-8					7.8E+02		4.1E+02	2.7E+02
				1.0E-02	X			V		3.0E+01	1.36E+09	1.0E+03	1		Trimethylpentene, 2,4,4-	25167-70-8					7.8E+02			7.8E+02
				3.0E-02	I						1.36E+09		1	0.019	Trinitrobenzene, 1,3,5-	99-35-4					2.3E+03	5.2E+04		2.2E+03
3.0E-02	I			5.0E-04	I						1.36E+09		1	0.032	Trinitrotoluene, 2,4,6-	118-96-7	2.3E+03	2.6E+04		2.1E+03	3.9E+01	5.2E+02		3.6E+01
				2.0E-02	P						1.36E+09		1	0.1	Triphenylphosphine Oxide	791-28-6					1.6E+03	6.6E+03		1.3E+03
				2.0E-02	A						1.36E+09		1	0.1	Tris(1,3-Dichloro-2-propyl) Phosphate	13674-87-8					1.6E+03	6.6E+03		1.3E+03
				1.0E-02	X						1.36E+09		1	0.1	Tris(1-chloro-2-propyl)phosphate	13674-84-5					7.8E+02	3.3E+03		6.3E+02
2.3E+00	C	6.6E-04	C					V		4.7E+02	1.36E+09	9.0E+05	1		Tris(2,3-dibromopropyl)phosphate	126-72-7	3.0E+01		3.8E+02	2.8E+01				
2.0E-02	P			7.0E-03	P						1.36E+09		1	0.1	Tris(2-chloroethyl)phosphate	115-96-8	3.5E+03	1.2E+04		2.7E+03	5.5E+02	2.3E+03		4.4E+02
3.2E-03	P			1.0E-01	P						1.36E+09		1	0.1	Tris(2-ethylhexyl)phosphate	78-42-2	2.2E+04	7.7E+04		1.7E+04	7.8E+03	3.3E+04		6.3E+03
				8.0E-04	P						1.36E+09		1		Tungsten	7440-33-7					6.3E+01			6.3E+01
				2.0E-04	A	4.0E-05	A				1.36E+09		1		Uranium	7440-61-1					1.6E+01		5.7E+04	1.6E+01
1.0E+00	C	2.9E-04	C						M		1.36E+09		1	0.1	Urethane	51-79-6	1.5E+01	6.0E+01	4.8E+05	1.2E+01				
		8.3E-03	P	9.0E-03	I	7.0E-06	P				1.36E+09		0.026		Vanadium Pentoxide	1314-62-1			4.6E+04	4.6E+04	7.0E+02		9.9E+03	6.6E+02
				5.0E-03	G	1.0E-04	A				1.36E+09		0.026		Vanadium and Compounds	7440-62-2					3.9E+02		1.4E+05	3.9E+02
				1.0E-03	I			V			1.36E+09	1.2E+05	1		Vernolate	1929-77-7					7.8E+01			7.8E+01
				1.2E-03	O						1.36E+09		1	0.1	Vinclozolin	50471-44-8					9.4E+01	4.0E+02		7.6E+01
				1.0E+00	H	2.0E-01	I	V		2.8E+03	1.36E+09	4.4E+03	1		Vinyl Acetate	108-05-4					7.8E+04		9.2E+02	9.1E+02
		3.2E-05	H			3.0E-03	I	V		2.5E+03	1.36E+09	1.4E+03	1		Vinyl Bromide	593-60-2			1.2E+01	1.2E+01			4.3E+00	4.3E+00
7.2E-01	I	4.4E-06	I	3.0E-03	I	1.0E-01	I	V	M	3.9E+03	1.36E+09	9.6E+02	1		Vinyl Chloride	75-01-4	9.4E+00		1.6E+01	5.9E+00	2.3E+02		1.0E+02	7.0E+01
				3.0E-04	I						1.36E+09		1	0.1	Warfarin	81-81-2					2.3E+01	9.9E+01		1.9E+01
				2.0E-01	G	1.0E-01	G	V		3.9E+02	1.36E+09	5.5E+03	1		Xylene, m-	108-38-3					1.6E+04		5.7E+02	5.5E+02
				2.0E-01	G	1.0E-01	G	V		4.3E+02	1.36E+09	6.5E+03	1		Xylene, o-	95-47-6					1.6E+04		6.7E+02	6.5E+02
				2.0E-01	G	1.0E-01	G	V		3.9E+02	1.36E+09	5.6E+03	1		Xylene, p-	106-42-3					1.6E+04		5.8E+02	5.6E+02
				2.0E-01	I	1.0E-01	I	V		2.6E+02	1.36E+09	5.7E+03	1		Xylenes	1330-20-7					1.6E+04		6.0E+02	5.8E+02
				3.0E-04	I						1.36E+09		1		Zinc Phosphide	1314-84-7					2.3E+01			2.3E+01
				3.0E-01	I						1.36E+09		1		Zinc and Compounds	7440-66-6					2.3E+04			2.3E+04
				5.0E-02	I						1.36E+09		1	0.1	Zineb	12122-67-7					3.9E+03	1.6E+04		3.2E+03
				8.0E-05	X						1.36E+09		1		Zirconium	7440-67-7					6.3E+00			6.3E+00

Federal Register Notice

- Military Munitions Rule
  62 FR 6622, February 12, 1997

General Resources for the Reactivity Characteristic

- Background document for the Reactivity characteristic

Toxicity

The regulations for the hazardous characteristic of toxicity can be found at 40 CFR 261.24.

Regulations for Toxicity

§261.24

(a) A solid waste (except manufactured gas plant waste) exhibits the characteristic of toxicity if, using the Toxicity Characteristic Leaching Procedure, test Method 1311 in "Test Methods for Evaluating Solid Waste, Physical/Chemical Methods," EPA Publication SW–846, as incorporated by reference in §260.11 of this chapter, the extract from a representative sample of the waste contains any of the contaminants listed in table 1 at the concentration equal to or greater than the respective value given in that table. Where the waste contains less than 0.5 percent filterable solids, the waste itself, after filtering using the methodology outlined in Method 1311, is considered to be the extract for the purpose of this section.

(b) A solid waste that exhibits the characteristic of toxicity has the EPA Hazardous Waste Number specified in Table 1 which corresponds to the toxic contaminant causing it to be hazardous.

Table 1 —Maximum Concentration of Contaminants for the Toxicity Characteristic

EPA HW No.[1]	Contaminant	CAS No.[2]	Regulatory Level (mg/L)
D004	Arsenic	7440–38–2	5.0
D005	Barium	7440–39–3	100.0
D018	Benzene	71–43–2	0.5
D006	Cadmium	7440–43–9	1.0
D019	Carbon tetrachloride	56–23–5	0.5
D020	Chlordane	57–74–9	0.03
D021	Chlorobenzene	108–90–7	100.0
D022	Chloroform	67–66–3	6.0

D007	Chromium	7440–47–3	5.0
D023	o-Cresol	95–48–7	[4]200.0
D024	m-Cresol	108–39–4	[4]200.0
D025	p-Cresol	106–44–5	[4]200.0
D026	Cresol		[4]200.0
D016	2,4-D	94–75–7	10.0
D027	1,4-Dichlorobenzene	106–46–7	7.5
D028	1,2-Dichloroethane	107–06–2	0.5
D029	1,1-Dichloroethylene	75–35–4	0.7
D030	2,4-Dinitrotoluene	121–14–2	[3]0.13
D012	Endrin	72–20–8	0.02
D031	Heptachlor (and its epoxide)	76–44–8	0.008
D032	Hexachlorobenzene	118–74–1	[3]0.13
D033	Hexachlorobutadiene	87–68–3	0.5
D034	Hexachloroethane	67–72–1	3.0
D008	Lead	7439–92–1	5.0
D013	Lindane	58–89–9	0.4
D009	Mercury	7439–97–6	0.2
D014	Methoxychlor	72–43–5	10.0
D035	Methyl ethyl ketone	78–93–3	200.0
D036	Nitrobenzene	98–95–3	2.0
D037	Pentrachlorophenol	87–86–5	100.0
D038	Pyridine	110–86–1	[3]5.0
D010	Selenium	7782–49–2	1.0
D011	Silver	7440–22–4	5.0
D039	Tetrachloroethylene	127–18–4	0.7
D015	Toxaphene	8001–35–2	0.5
D040	Trichloroethylene	79–01–6	0.5
D041	2,4,5-Trichlorophenol	95–95–4	400.0
D042	2,4,6-Trichlorophenol	88–06–2	2.0

D017	2,4,5-TP (Silvex)	93–72–1	1.0
D043	Vinyl chloride	75–01–4	0.2

[1]Hazardous waste number.
[2]Chemical abstracts service number.
[3]Quantitation limit is greater than the calculated regulatory level. The quantitation limit therefore becomes the regulatory level.
[4]If o-, m-, and p-Cresol concentrations cannot be differentiated, the total cresol (D026) concentration is used. The regulatory level of total cresol is 200 mg/l.
[55 FR 11862, Mar. 29, 1990, as amended at 55 FR 22684, June 1, 1990; 55 FR 26987, June 29, 1990; 58 FR 46049, Aug. 31, 1993; 67 FR 11254, Mar. 13, 2002; 71 FR 40259, July 14, 2006]

General Resources for the Toxicity Characteristic

- Methods for Determining Characteristics of Hazardous Waste, SW-846, Chapter 8

Federal Register Notices

- Final Rule: Toxicity Characteristic
  55 FR 11829: March 29, 1,90

- Proposed Rule: Hazardous Waste Management System; Modification of the Hazardous Waste Recycling Regulatory Program
  58 FR 8102, February 11, 1993

- Request for Comment on Proposed Statement of Policy Regarding Spent Antifreeze
  63 FR 20187, April 23, 1998

Letters/Memoranda

Antifreeze

- USED AUTOMOBILE ANTIFREEZE DISPOSAL
- SPENT ANTI-FREEZE COOLANT REGULATORY STATUS
- SPENT ANTIFREEZE AND THE TOXICITY CHARACTERISTIC

Biosolids

- BIOSOLIDS

Chromium/Trivalent Chromium

- HAZARDOUS WASTE TESTING ISSUES

375-6.8 Soil cleanup objective tables.

(a) Unrestricted use soil cleanup objectives.

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
Metals		
Arsenic	7440-38-2	13 [c]
Barium	7440-39-3	350 [c]
Beryllium	7440-41-7	7.2
Cadmium	7440-43-9	2.5 [c]
Chromium, hexavalent [e]	18540-29-9	1[b]
Chromium, trivalent [e]	16065-83-1	30 [c]
Copper	7440-50-8	50
Total Cyanide [e, f]		27
Lead	7439-92-1	63 [c]
Manganese	7439-96-5	1600 [c]
Total Mercury		0.18 [c]
Nickel	7440-02-0	30
Selenium	7782-49-2	3.9[c]
Silver	7440-22-4	2
Zinc	7440-66-6	109 [c]
PCBs/Pesticides		
2,4,5-TP Acid (Silvex) [f]	93-72-1	3.8
4,4'-DDE	72-55-9	0.0033 [b]
4,4'-DDT	50-29-3	0.0033 [b]
4,4'-DDD	72-54-8	0.0033 [b]
Aldrin	309-00-2	0.005 [c]
alpha-BHC	319-84-6	0.02
beta-BHC	319-85-7	0.036
Chlordane (alpha)	5103-71-9	0.094

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
delta-BHC [g]	319-86-8	0.04
Dibenzofuran [f]	132-64-9	7
Dieldrin	60-57-1	0.005 [c]
Endosulfan I [d, f]	959-98-8	2.4
Endosulfan II [d, f]	33213-65-9	2.4
Endosulfan sulfate [d, f]	1031-07-8	2.4
Endrin	72-20-8	0.014
Heptachlor	76-44-8	0.042
Lindane	58-89-9	0.1
Polychlorinated biphenyls	1336-36-3	0.1
Semivolatile organic compounds		
Acenaphthene	83-32-9	20
Acenapthylene [f]	208-96-8	100 [a]
Anthracene [f]	120-12-7	100 [a]
Benz(a)anthracene [f]	56-55-3	1 [c]
Benzo(a)pyrene	50-32-8	1 [c]
Benzo(b)fluoranthene [f]	205-99-2	1 [c]
Benzo(g,h,i)perylene [f]	191-24-2	100
Benzo(k)fluoranthene [f]	207-08-9	0.8 [c]
Chrysene [f]	218-01-9	1 [c]
Dibenz(a,h)anthracene [f]	53-70-3	0.33 [b]
Fluoranthene [f]	206-44-0	100 [a]
Fluorene	86-73-7	30
Indeno(1,2,3-cd)pyrene [f]	193-39-5	0.5 [c]
m-Cresol [f]	108-39-4	0.33 [b]
Naphthalene [f]	91-20-3	12
o-Cresol [f]	95-48-7	0.33 [b]

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
p-Cresol [f]	106-44-5	0.33 [b]
Pentachlorophenol	87-86-5	0.8 [b]
Phenanthrene [f]	85-01-8	100
Phenol	108-95-2	0.33 [b]
Pyrene [f]	129-00-0	100
Volatile organic compounds		
1,1,1-Trichloroethane [f]	71-55-6	0.68
1,1-Dichloroethane [f]	75-34-3	0.27
1,1-Dichloroethene [f]	75-35-4	0.33
1,2-Dichlorobenzene [f]	95-50-1	1.1
1,2-Dichloroethane	107-06-2	0.02 [c]
cis -1,2-Dichloroethene [f]	156-59-2	0.25
trans-1,2-Dichloroethene [f]	156-60-5	0.19
1,3-Dichlorobenzene [f]	541-73-1	2.4
1,4-Dichlorobenzene	106-46-7	1.8
1,4-Dioxane	123-91-1	0.1 [b]
Acetone	67-64-1	0.05
Benzene	71-43-2	0.06
n-Butylbenzene [f]	104-51-8	12
Carbon tetrachloride [f]	56-23-5	0.76
Chlorobenzene	108-90-7	1.1
Chloroform	67-66-3	0.37
Ethylbenzene [f]	100-41-4	1
Hexachlorobenzene [f]	118-74-1	0.33[b]
Methyl ethyl ketone	78-93-3	0.12
Methyl tert-butyl ether [f]	1634-04-4	0.93
Methylene chloride	75-09-2	0.05

Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives

Contaminant	CAS Number	Unrestricted Use
n - Propylbenzene [f]	103-65-1	3.9
sec-Butylbenzene [f]	135-98-8	11
tert-Butylbenzene [f]	98-06-6	5.9
Tetrachloroethene	127-18-4	1.3
Toluene	108-88-3	0.7
Trichloroethene	79-01-6	0.47
1,2,4-Trimethylbenzene [f]	95-63-6	3.6
1,3,5-Trimethylbenzene[f]	108-67-8	8.4
Vinyl chloride[f]	75-01-4	0.02
Xylene (mixed)	1330-20-7	0.26

All soil cleanup objectives (SCOs) are in parts per million (ppm).

Footnotes

[a] The SCOs for unrestricted use were capped at a maximum value of 100 ppm. See Technical Support Document (TSD), section 9.3.

[b] For constituents where the calculated SCO was lower than the contract required quantitation limit (CRQL), the CRQL is used as the Track 1 SCO value.

[c] For constituents where the calculated SCO was lower than the rural soil background concentration, as determined by the Department and Department of Health rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.

[d] SCO is the sum of endosulfan I, endosulfan II and endosulfan sulfate.

[e] The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.

[f] Protection of ecological resources SCOs were not developed for contaminants identified in Table 375-6.8(b) with “NS”. Where such contaminants appear in Table 375-6.8(a), the applicant may be required by the Department to calculate a protection of ecological resources SCO according to the TSD.

ATTACHMENT D

Laboratory Method Detection Limits

Limits for EPA RST2 - RFP No. 636

Method Description	Method Code	Analyte Description	CAS Number	RL	MDL	Units
Gamma Spec	GA-01-R	Actinium 228	14331-83-0	1.00		pCi/g
		Bismuth-212	14913-49-6	3.00		pCi/g
		Bismuth-214	14733-03-0	1.00		pCi/g
		Cesium-137	10045-97-3	0.200		pCi/g
		Lead-212	15092-94-1	0.300		pCi/g
		Lead-214	15067-28-4	1.00		pCi/g
		Potassium-40	13966-00-2	1.50		pCi/g
		Protactinium-234	378783-76-7	1.50		pCi/g
		Radium-224	13233-32-4	5.00		pCi/g
		Radium-226	13982-63-3	1.00		pCi/g
		Radium-228	15262-20-1	1.00		pCi/g
		Thallium-208	14913-50-9	0.200		pCi/g
		Thorium-234	15065-10-8	4.00		pCi/g
Isotopic Uranium (Alpha Spec)	A-01-R	Uranium-233/234	13966-29-5	1.00		pCi/g
		Uranium-235/236	15117-96-1	1.00		pCi/g
		Uranium-238	7440-61-1	1.00		pCi/g
Isotopic Thorium (Alpha Spec)	A-01-R	Thorium-228	14274-82-9	1.00		pCi/g
		Thorium-230	14269-63-7	1.00		pCi/g
		Thorium-232	7440-29-1	1.00		pCi/g
Isotopic Uranium (ICPMS)	6020A	U-233	13968-55-3	0.00600	0.00300	mg/Kg
		U-234	13966-29-5	0.00600	0.00300	mg/Kg
		U-235	15117-96-1	0.00600	0.00300	mg/Kg
		U-236	13982-70-2	0.00600	0.00300	mg/Kg
		U-238	7440-61-1	0.00600	0.00300	mg/Kg
Thorium (ICP/MS)	6020A	Thorium	7440-29-1	0.200	0.135	mg/Kg

Limits for EPA RST2 - RFP No. 636

Method Description	Method Code	Analyte Description	CAS Number	RL	MDL	Units
TCLP VOCs	8260C	1,1-Dichloroethene	75-35-4	0.00100	0.000260	mg/L
		1,2-Dichloroethane	107-06-2	0.00100	0.000430	mg/L
		1,4-Dichlorobenzene	106-46-7	0.00100	0.000330	mg/L
		2-Butanone (MEK)	78-93-3	0.00500	0.00185	mg/L
		Benzene	71-43-2	0.00100	0.000200	mg/L
		Carbon tetrachloride	56-23-5	0.00100	0.000210	mg/L
		Chlorobenzene	108-90-7	0.00100	0.000380	mg/L
		Chloroform	67-66-3	0.00100	0.000330	mg/L
		Tetrachloroethene	127-18-4	0.00100	0.000250	mg/L
		Trichloroethene	79-01-6	0.00100	0.000310	mg/L
		Vinyl chloride	75-01-4	0.00100	0.000170	mg/L
TCLP SVOCs	8270D	1,4-Dichlorobenzene	106-46-7	0.0100	0.000400	mg/L
		2,4,5-Trichlorophenol	95-95-4	0.0100	0.000800	mg/L
		2,4,6-Trichlorophenol	88-06-2	0.0100	0.000800	mg/L
		2,4-Dinitrotoluene	121-14-2	0.00200	0.00100	mg/L
		2-Methylphenol	95-48-7	0.0100	0.000600	mg/L
		3 & 4 Methylphenol	15831-10-4	0.0100	0.000600	mg/L
		Hexachlorobenzene	118-74-1	0.00100	0.000400	mg/L
		Hexachlorobutadiene	87-68-3	0.00200	0.000800	mg/L
		Hexachloroethane	67-72-1	0.00200	0.00120	mg/L
		Nitrobenzene	98-95-3	0.00100	0.000600	mg/L
		Pentachlorophenol	87-86-5	0.0300	0.00140	mg/L
		Pyridine	110-86-1	0.0100	0.00190	mg/L
TCLP Pesticides	8081B	Chlordane (technical)	12789-03-6	0.00500	0.0000550	mg/L
		cis-Chlordane	5103-71-9	0.000500	0.00000200	mg/L
		Endrin	72-20-8	0.000500	0.00000400	mg/L
		gamma-BHC (Lindane)	58-89-9	0.000500	0.0000120	mg/L
		Heptachlor	76-44-8	0.000500	0.00000300	mg/L
		Heptachlor epoxide	1024-57-3	0.000500	0.00000500	mg/L
		Methoxychlor	72-43-5	0.000500	0.00000400	mg/L
		Toxaphene	8001-35-2	0.00500	0.000110	mg/L
		trans-Chlordane	5103-74-2	0.000500	0.00000300	mg/L
TCLP Herbicides	8151A	2,4-D	94-75-7	0.0830	0.00500	mg/L
		Silvex (2,4,5-TP)	93-72-1	0.0830	0.00400	mg/L
TCLP Metals	6010D	Arsenic	7440-38-2	0.0150	0.00333	mg/L
		Barium	7440-39-3	0.200	0.0132	mg/L
		Cadmium	7440-43-9	0.00400	0.000327	mg/L
		Chromium	7440-47-3	0.0100	0.00498	mg/L
		Lead	7439-92-1	0.0100	0.00235	mg/L
		Selenium	7782-49-2	0.0200	0.00588	mg/L
		Silver	7440-22-4	0.0100	0.00578	mg/L
TCLP Mercury	7470A	Mercury	7439-97-6	0.000200	0.0000910	mg/L
Ignitability	1030	Burn Rate	STL00120	2.20		mm/sec
pH	9045D	Corrosivity	STL00179	0.1		SU
		pH	STL00204	0.1		SU
Cyanide, Reactive	9014_Reactive(	Cyanide, Reactive	STL00045	25.0		mg/Kg
Sulfide, Reactive	9034_Reactive	Sulfide, Reactive	STL00261	20.0	11.3	mg/Kg

Limits for EPA RST2 - RFP No. 636

Method Description	Method Code	Analyte Description	CAS Number	RL	MDL	Units
Percent Moisture	Moisture	Percent Moisture	STL00177	1.00		%
		Percent Solids	STL00234	1.00		%
TCL VOCs	8260C	1,1,1-Trichloroethane	71-55-6	1.00	0.233	ug/Kg
		1,1,2,2-Tetrachloroetha	79-34-5	1.00	0.214	ug/Kg
		1,1,2-Trichloro-1,2,2-tri	76-13-1	1.00	0.301	ug/Kg
		1,1,2-Trichloroethane	79-00-5	1.00	0.178	ug/Kg
		1,1-Dichloroethane	75-34-3	1.00	0.206	ug/Kg
		1,1-Dichloroethene	75-35-4	1.00	0.225	ug/Kg
		1,2,3-Trichlorobenzene	87-61-6	1.00	0.181	ug/Kg
		1,2,4-Trichlorobenzene	120-82-1	1.00	0.358	ug/Kg
		1,2-Dibromo-3-Chlorop	96-12-8	1.00	0.460	ug/Kg
		1,2-Dichlorobenzene	95-50-1	1.00	0.361	ug/Kg
		1,2-Dichloroethane	107-06-2	1.00	0.296	ug/Kg
		1,2-Dichloropropane	78-87-5	1.00	0.423	ug/Kg
		1,3-Dichlorobenzene	541-73-1	1.00	0.365	ug/Kg
		1,4-Dichlorobenzene	106-46-7	1.00	0.225	ug/Kg
		1,4-Dioxane	123-91-1	20.0	9.18	ug/Kg
		2-Butanone (MEK)	78-93-3	5.00	0.368	ug/Kg
		2-Hexanone	591-78-6	5.00	1.71	ug/Kg
		4-Methyl-2-pentanone (	108-10-1	5.00	1.56	ug/Kg
		Acetone	67-64-1	6.00	5.72	ug/Kg
		Benzene	71-43-2	1.00	0.258	ug/Kg
		Bromoform	75-25-2	1.00	0.425	ug/Kg
		Bromomethane	74-83-9	1.00	1.00	ug/Kg
		Carbon disulfide	75-15-0	1.00	0.266	ug/Kg
		Carbon tetrachloride	56-23-5	1.00	0.387	ug/Kg
		Chlorobenzene	108-90-7	1.00	0.177	ug/Kg
		Chlorobromomethane	74-97-5	1.00	0.281	ug/Kg
		Chlorodibromomethane	124-48-1	1.00	0.194	ug/Kg
		Chloroethane	75-00-3	1.00	0.522	ug/Kg
		Chloroform	67-66-3	1.00	0.971	ug/Kg
		Chloromethane	74-87-3	1.00	0.435	ug/Kg
		cis-1,2-Dichloroethene	156-59-2	1.00	0.358	ug/Kg
		cis-1,3-Dichloropropen	10061-01-5	1.00	0.273	ug/Kg
		Cyclohexane	110-82-7	1.00	0.221	ug/Kg
		Dichlorobromomethane	75-27-4	1.00	0.257	ug/Kg
		Dichlorodifluoromethan	75-71-8	1.00	0.338	ug/Kg
		Ethylbenzene	100-41-4	1.00	0.199	ug/Kg
		Ethylene Dibromide	106-93-4	1.00	0.180	ug/Kg
		Isopropylbenzene	98-82-8	1.00	0.285	ug/Kg
		Methyl acetate	79-20-9	5.00	4.30	ug/Kg
		Methyl tert-butyl ether	1634-04-4	1.00	0.512	ug/Kg
		Methylcyclohexane	108-87-2	1.00	0.499	ug/Kg
		Methylene Chloride	75-09-2	1.00	1.15	ug/Kg
		m-Xylene & p-Xylene	179601-23-1	1.00	0.174	ug/Kg
		o-Xylene	95-47-6	1.00	0.194	ug/Kg
		Styrene	100-42-5	1.00	0.278	ug/Kg
		Tentatively Identified C	STL00231			ug/Kg
		Tetrachloroethene	127-18-4	1.00	0.305	ug/Kg
		Toluene	108-88-3	1.00	0.234	ug/Kg
		trans-1,2-Dichloroether	156-60-5	1.00	0.246	ug/Kg
		trans-1,3-Dichloroprope	10061-02-6	1.00	0.266	ug/Kg
		Trichloroethene	79-01-6	1.00	0.321	ug/Kg
		Trichlorofluoromethane	75-69-4	1.00	0.406	ug/Kg
		Vinyl chloride	75-01-4	1.00	0.546	ug/Kg

Limits for EPA RST2 - RFP No. 636

Method Description	Method Code	Analyte Description	CAS Number	RL	MDL	Units
TCL SVOCs	8270D	1,1'-Biphenyl	92-52-4	330	4.39	ug/Kg
		1,2,4,5-Tetrachloroben	95-94-3	330	10.3	ug/Kg
		2,2'-oxybis[1-chloropro	108-60-1	330	5.99	ug/Kg
		2,3,4,6-Tetrachlorophe	58-90-2	330	22.4	ug/Kg
		2,4,5-Trichlorophenol	95-95-4	330	33.7	ug/Kg
		2,4,6-Trichlorophenol	88-06-2	133	42.5	ug/Kg
		2,4-Dichlorophenol	120-83-2	133	21.2	ug/Kg
		2,4-Dimethylphenol	105-67-9	330	14.5	ug/Kg
		2,4-Dinitrophenol	51-28-5	266	163	ug/Kg
		2,4-Dinitrotoluene	121-14-2	67.0	35.6	ug/Kg
		2,6-Dinitrotoluene	606-20-2	67.0	23.9	ug/Kg
		2-Chloronaphthalene	91-58-7	330	15.3	ug/Kg
		2-Chlorophenol	95-57-8	330	11.8	ug/Kg
		2-Methylnaphthalene	91-57-6	330	9.25	ug/Kg
		2-Methylphenol	95-48-7	330	12.4	ug/Kg
		2-Nitroaniline	88-74-4	330	12.4	ug/Kg
		2-Nitrophenol	88-75-5	330	33.1	ug/Kg
		3,3'-Dichlorobenzidine	91-94-1	133	50.0	ug/Kg
		3-Nitroaniline	99-09-2	330	37.3	ug/Kg
		4,6-Dinitro-2-methylphe	534-52-1	266	135	ug/Kg
		4-Bromophenyl phenyl	101-55-3	330	13.1	ug/Kg
		4-Chloro-3-methylphen	59-50-7	330	18.6	ug/Kg
		4-Chloroaniline	106-47-8	330	58.7	ug/Kg
		4-Chlorophenyl phenyl	7005-72-3	330	11.7	ug/Kg
		4-Methylphenol	106-44-5	330	20.7	ug/Kg
		4-Nitroaniline	100-01-6	330	38.0	ug/Kg
		4-Nitrophenol	100-02-7	670	53.9	ug/Kg
		Acenaphthene	83-32-9	330	9.43	ug/Kg
		Acenaphthylene	208-96-8	330	3.33	ug/Kg
		Acetophenone	98-86-2	330	16.2	ug/Kg
		Anthracene	120-12-7	330	10.1	ug/Kg
		Atrazine	1912-24-9	133	19.5	ug/Kg
		Benzaldehyde	100-52-7	330	54.7	ug/Kg
		Benzo[a]anthracene	56-55-3	33.0	11.5	ug/Kg
		Benzo[a]pyrene	50-32-8	33.0	8.81	ug/Kg
		Benzo[b]fluoranthene	205-99-2	33.0	8.56	ug/Kg
		Benzo[g,h,i]perylene	191-24-2	330	9.76	ug/Kg
		Benzo[k]fluoranthene	207-08-9	33.0	6.49	ug/Kg
		Bis(2-chloroethoxy)met	111-91-1	330	25.8	ug/Kg
		Bis(2-chloroethyl)ether	111-44-4	33.0	11.5	ug/Kg
		Bis(2-ethylhexyl) phtha	117-81-7	330	17.5	ug/Kg
		Butyl benzyl phthalate	85-68-7	330	15.5	ug/Kg
		Caprolactam	105-60-2	330	51.5	ug/Kg
		Carbazole	86-74-8	330	12.6	ug/Kg
		Chrysene	218-01-9	330	5.59	ug/Kg
		Dibenz(a,h)anthracene	53-70-3	33.0	14.3	ug/Kg
		Dibenzofuran	132-64-9	330	4.65	ug/Kg
		Diethyl phthalate	84-66-2	330	4.79	ug/Kg
		Dimethyl phthalate	131-11-3	330	75.2	ug/Kg
		Di-n-butyl phthalate	84-74-2	330	12.5	ug/Kg
		Di-n-octyl phthalate	117-84-0	330	17.5	ug/Kg
		Fluoranthene	206-44-0	330	11.6	ug/Kg
		Fluorene	86-73-7	330	4.49	ug/Kg
		Hexachlorobenzene	118-74-1	33.0	15.7	ug/Kg
		Hexachlorobutadiene	87-68-3	67.0	7.04	ug/Kg
		Hexachlorocyclopentac	77-47-4	330	29.0	ug/Kg
		Hexachloroethane	67-72-1	33.0	11.4	ug/Kg
		Indeno[1,2,3-cd]pyrene	193-39-5	33.0	12.9	ug/Kg
		Isophorone	78-59-1	133	95.6	ug/Kg
		Naphthalene	91-20-3	330	5.72	ug/Kg
		Nitrobenzene	98-95-3	33.0	7.94	ug/Kg
		N-Nitrosodi-n-propylam	621-64-7	33.0	24.0	ug/Kg
		N-Nitrosodiphenylamin	86-30-6	330	27.2	ug/Kg
		Pentachlorophenol	87-86-5	266	67.8	ug/Kg
		Phenanthrene	85-01-8	330	5.81	ug/Kg
		Phenol	108-95-2	330	12.2	ug/Kg
		Pyrene	129-00-0	330	8.23	ug/Kg
		Tentatively Identified C	STL00231	330		ug/Kg

Limits for EPA RST2 - RFP No. 636

Method Description	Method Code	Analyte Description	CAS Number	RL	MDL	Units
TAL Metals	6020B	Aluminum	7429-90-5	20.0	2.60	mg/Kg
		Antimony	7440-36-0	1.00	0.146	mg/Kg
		Arsenic	7440-38-2	1.00	0.100	mg/Kg
		Barium	7440-39-3	2.00	0.145	mg/Kg
		Beryllium	7440-41-7	0.400	0.0570	mg/Kg
		Cadmium	7440-43-9	1.00	0.113	mg/Kg
		Calcium	7440-70-2	100	17.0	mg/Kg
		Chromium	7440-47-3	2.00	0.174	mg/Kg
		Cobalt	7440-48-4	2.00	0.148	mg/Kg
		Copper	7440-50-8	2.00	0.220	mg/Kg
		Iron	7439-89-6	60.0	20.2	mg/Kg
		Lead	7439-92-1	0.600	0.200	mg/Kg
		Magnesium	7439-95-4	100	10.2	mg/Kg
		Manganese	7439-96-5	4.00	0.403	mg/Kg
		Nickel	7440-02-0	2.00	0.194	mg/Kg
		Potassium	7440-09-7	100	11.2	mg/Kg
		Selenium	7782-49-2	1.25	0.118	mg/Kg
		Silver	7440-22-4	1.00	0.0890	mg/Kg
		Sodium	7440-23-5	100	15.6	mg/Kg
		Thallium	7440-28-0	0.400	0.0410	mg/Kg
		Vanadium	7440-62-2	2.00	0.206	mg/Kg
		Zinc	7440-66-6	8.00	2.29	mg/Kg
total Mercury	7471B	Mercury	7439-97-6	0.0170	0.00400	mg/Kg
Cyanide, Total	9012B	Cyanide, Total	57-12-5	0.240	0.123	mg/Kg
TCL Pesticides	8081B	4,4'-DDD	72-54-8	6.70	1.14	ug/Kg
		4,4'-DDE	72-55-9	6.70	0.790	ug/Kg
		4,4'-DDT	50-29-3	6.70	1.23	ug/Kg
		Aldrin	309-00-2	6.70	1.01	ug/Kg
		alpha-BHC	319-84-6	2.00	0.680	ug/Kg
		beta-BHC	319-85-7	2.00	0.750	ug/Kg
		Chlordane (technical)	12789-03-6	67.0	16.2	ug/Kg
		delta-BHC	319-86-8	2.00	0.410	ug/Kg
		Dieldrin	60-57-1	2.00	0.870	ug/Kg
		Endosulfan I	959-98-8	6.70	1.02	ug/Kg
		Endosulfan II	33213-65-9	6.70	1.72	ug/Kg
		Endosulfan sulfate	1031-07-8	6.70	0.840	ug/Kg
		Endrin	72-20-8	6.70	0.960	ug/Kg
		Endrin aldehyde	7421-93-4	6.70	1.58	ug/Kg
		Endrin ketone	53494-70-5	6.70	1.30	ug/Kg
		gamma-BHC (Lindane)	58-89-9	2.00	0.620	ug/Kg
		Heptachlor	76-44-8	6.70	0.790	ug/Kg
		Heptachlor epoxide	1024-57-3	6.70	1.00	ug/Kg
		Methoxychlor	72-43-5	6.70	1.53	ug/Kg
		Toxaphene	8001-35-2	67.0	24.2	ug/Kg
PCBs	8082A	Aroclor 1016	12674-11-2	67.0	8.90	ug/Kg
		Aroclor 1221	11104-28-2	67.0	8.90	ug/Kg
		Aroclor 1232	11141-16-5	67.0	8.90	ug/Kg
		Aroclor 1242	53469-21-9	67.0	8.90	ug/Kg
		Aroclor 1248	12672-29-6	67.0	8.90	ug/Kg
		Aroclor 1254	11097-69-1	67.0	9.20	ug/Kg
		Aroclor 1260	11096-82-5	67.0	9.20	ug/Kg
		Aroclor 1268	11100-14-4	67.0	9.20	ug/Kg
		Aroclor-1262	37324-23-5	67.0	9.20	ug/Kg
		Polychlorinated biphen	1336-36-3	67.0	9.20	ug/Kg
Herbicides	8151A	2,4,5-T	93-76-5	33.3	7.08	ug/Kg
		2,4-D	94-75-7	33.3	12.1	ug/Kg
		Silvex (2,4,5-TP)	93-72-1	33.3	3.47	ug/Kg